Lund Easement Baseline Biological Inventory

Prepared for:
The Natural Resource Conservation Service

By:
Catherine Jean and Paul Hendricks

Montana Natural Heritage Program
Natural Resource Information System
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INTRODUCTION

The Lund property is part of the Prairie Pothole region of Montana, an area encompassing one of largest mixed-grass prairie and wetland complexes remaining in the Northern Great Plains. This region has high biodiversity values and is considered a focal area for wetland and prairie grassland protection and restoration by the Fish and Wildlife Service (FWS, 2001) and in Canada, the Alberta Conservation Data Center recognizes Sage Creek watershed as nationally significant (TNC, 1999). Conservation initiatives are increasingly used to help maintain these important habitats for plant and animal species.

In the United States, the Wetlands Reserve Program (WRP) provides private landowners financial incentives to voluntarily retire marginal agricultural land by placing property under conservation easement. The Lund property has a valuable mix of grassland and wetland vegetation and was placed under easement with the Natural Resource Conservation Service (NRCS) for the purpose of wetland restoration and enhancement.

Foxtail Barley

A portion of the easement, on what is known as Wild Horse Lake, was highly modified in the past with dikes and ditches constructed to drain natural hay meadows. NRCS is working together with the landowner on a wetland restoration project that is aimed at reclaiming and restoring a portion of the prairie wetland. This WRP project represents an important effort to restore biological diversity to the Prairie Pothole region in Montana by restoring this grassland-wetland ecosystem.

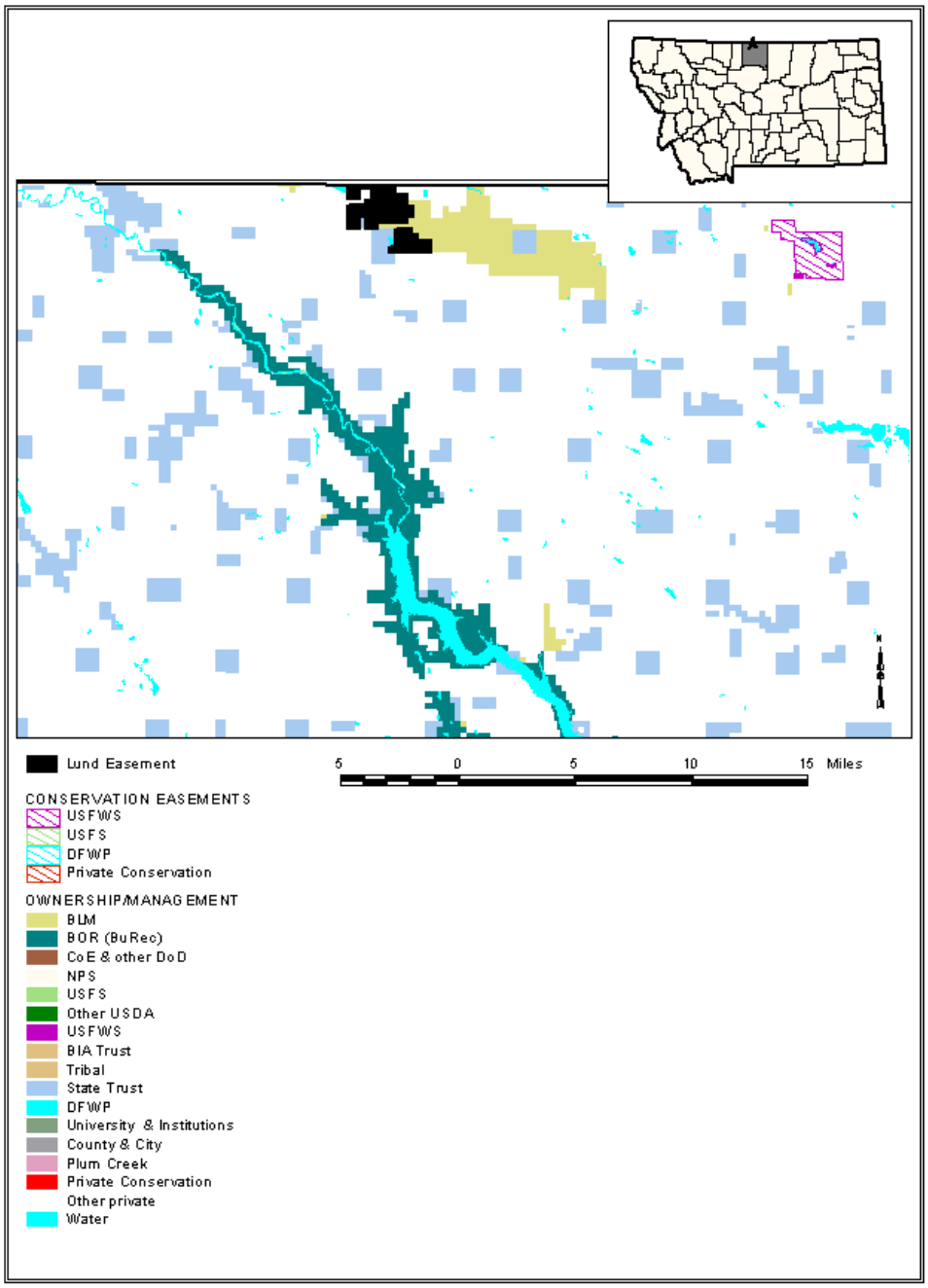
METHODS

The goal of this project was to compile baseline biological information on the Lund Easement to build a scientific foundation for ecosystem monitoring and assessment and to inform wetland restoration and management plans. Inventories were conducted to gather basic information about key biological resources including presence or absence of plant and animal species of concern and other noteworthy observations. Natural plant communities were sampled and described with emphasis upon those that exemplify the Montana Glaciated Plains landscape.

- **Data Collection**

Plant and natural community surveys were conducted during the summer of 2000 and mammal and bird surveys took place on 18-20 July in 2000 and 26-28 May in 2001. Our inventory was designed to systematically inventory and evaluate the distribution, habitats and status of the biological resources on the Lund Easement. We started by searching the Heritage element occurrence database and checking available literature to identify potential target plant and animal Species of Concern (Carlson, 2001 and Heidel, 2001) with habitat in the Wild Horse Lake area. Inventories for several plant species of concern associated with wet or vernally moist areas were cancelled due to extreme drought in 2000 and 2001.

Figure 1. Lund Easement Study Area



In the Field, plant associations were recorded using a Rapid Ecological Assessment (REA) technique to characterize the vegetation across the landscape catena. With this technique, composition and cover of dominant species are recorded for all communities across environmental gradients. The REA technique is favored where the vegetation community has already been classification and described and, documentation within a project areas is the principle objective. Circular 1/10-acre vegetation plots were established in stands with homogeneous vegetation and uniform environmental conditions. We recorded vegetation structure and floristic composition, plot location and environmental data, and made comments on disturbance evidence, exotic species and community size condition and landscape context.

Due to limited field time, and the relatively small study area, we documented birds as they were encountered by traversing daily as much of the study area as possible, both via vehicle and on foot. This sampling approach generated a species list, with associated evidence of breeding status, but was not designed to document relative abundance (Bibby et al, 2000). Efforts to locate wetland-related bird species were largely thwarted due to drought conditions both years and extremely limited availability of surface water. However, we visited stock ponds and tanks to document transient wetland species. Dry lakebeds and native upland grassland with ground squirrel activity and sparse vegetation were scanned daily for Burrowing Owl and Mountain Plover, using a 60X spotting scope. We inspected all windbreaks, isolated stands of trees, and abandoned buildings for active nests of raptors and other species.

Large and medium-sized mammals were documented whenever encountered, but we made no attempt to sample them systematically. We trapped small mammals in both years. Traps were distributed along trap lines consisting of 10 trap-stations/line. In 2000 we placed one Sherman live trap at each station and one museum special snap trap at alternate stations on each line. In 2001 we placed a single live trap at each station on all lines. Trap stations were 20 paces (about 20 m) apart. Live traps were baited with rolled oats, snap traps with peanut butter. We ran six lines (1-6) for a single night in July 2000 and six more (7-12) for a single night in May 2001 (see **Figure 2, Table 1**). Lines 1, 4, and 12 were in upland short-grass habitat; lines 2, 3, 7, and 9 were in stands of lakebed-margin sagebrush; lines 5, 6, 10, and 11 were in lakebed depression "grassland"; line 8 was along a fence row in mixed cropland of wheat and crested wheatgrass stubble with sandy soil.

Table 1. Small mammals captured on 12 trap lines in the Wild Horse Lake study area, Hill County, Montana. Lines 1-6 were trapped the night of 19 July 2000; Lines 7-12 were trapped the night of 27 May 2001

Line 1	(T37N R12E Sec. 15SWSW)	no captures
Line 2	(T37N R12E Sec. 16NESE)	Deer Mouse (4)
Line 3	(T37N R12E Sec. 9SWSW)	Deer Mouse (4), Northern Grasshopper Mouse (1)
Line 4	(T37N R12E Sec. 8SESW)	no captures
Line 5	(T37N R12E Sec. 9NWSE)	no captures
Line 6	(T37N R12E Sec. 9NESW)	no captures
Line 7	(T37N R12E Sec. 9SWSW)	Deer Mouse (3), Richardson's Ground Squirrel (2)
Line 8	(T37N R12E Sec. 14NWNW)	Olive-backed Pocket Mouse (1)
Line 9	(T37N R12E Sec. 8SENE)	Deer Mouse (2)
Line 10	(T37N R12E Sec. 9NWSW)	Deer Mouse (2)
Line 11	(T37N R12E Sec. 4NWNW)	Deer Mouse (1)
Line 12	(T37N R12E Sec. 8SWSW)	Deer Mouse (2)

Deer Mouse = *Peromyscus maniculatus*; Northern Grasshopper Mouse = *Onychomys leucogaster*; Olive-backed Pocket Mouse = *Perognathus fasciatus*; Richardson's Ground Squirrel = *Speromophilus richarsonii*

We also inspected fence lines for raptor pellets; collected pellets were dissected for mammal skull fragments. We based species determinations of all trapped mammals and recovered skull fragments on external and skull characteristics described in Foresman (2001b).

- **Data Management**

Community ecology plots were located and recorded with a Global Positioning System (GPS) and later uploaded into a Geographic Information System (GIS). All plot data were transcribed to a computerized database for analysis and permanent storage in Heritage data system. Vegetation maps were digitized using ArcView edit and saved as a shapefile. Digital Orthophotos and USGS Quad maps in Digital Raster Graphic formats were used to digitize vegetation boundaries; community ecology plots were used to identify the vegetation type. The minimum map unit is aproximately10 acres, leaving many small patch or linear communities unmapped e.g. common spike rush (*Eleocharis palustris*) within linear sloughs.

Community and bird element occurrence data were geo-referenced, digitized and incorporated into the Montana Natural Heritage Program data system. Nest and small mammal trap locations were digitized from latitude and longitude coordinates obtained from 1:24,000 quad maps.

- **Plant Community Classification**

Species composition and cover for each plot was compared to existing classification schemes to determine the community type assignment. Plot assignments to plant association are also evaluated in terms of abiotic site descriptors. We organized our findings within the International Vegetation Classification System (ABI, 2000). The classification is hierarchical and combines floristics at the lowest levels (associations and alliances) and structure (physiognomy) and overarching climate conditions at the highest levels. The Federal Geographic Data Committee (FGDC, 1997) has approved the upper levels of the hierarchy as a classification standard. In this report, the plant association is defined in terms of the dominant species of the uppermost vegetation layer, and any co-dominant species or diagnostic species in the same strata separated with a dash; understory species are separated with a slash.

- **Nomenclature**

The principal floristic references for plant identification are “Flora of the Great Plains” (The Great Plains Flora Association, (1977, 1986)), “Vascular Plants of Montana” (Dorn, 1984) and “Flora of the Pacific Northwest” (Hitchcock and Cronquist, 1973). Plant nomenclature follows Kartesz (1999); as a consequence, recent taxonomic revisions to the wheat-grass tribe (*Elymus* and *Agropyron*) have resulted in new names for once familiar sounding scientific names. Thus western wheatgrass (*Agropyron smithii)* in Booth (1950) and Hitchcock and Cronquist (1973) and *Elymus smithii* in Dorn (1984) is now referenced as *Pascopyrum smithii*. Synonymy of dominant and indicator plants used in plant association names is presented in **Table 2**.

Common and scientific names of birds and mammals follow the “Checklist of North American Birds, 7th edition” (American Ornithologists’ Union, 1998) and “The wild mammals of Montana” (Foresman, 2001a), respectively.

Table 2. Synonymy of dominant and indicator plants on the Lund Easement

Common name	In: Booth (1950), (1966) or Great Plains Flora Assoc. (1986)	In: Dorn (1984)	In: Kartesz (1999)
Thickspike wheatgrass	*Agropyron dasystachyum*	*Elymus lanceolatus*	*Elymus lanceolatus*
Western wheatgrass	*Agropyron smithii*	*Elymus smithii*	*Pascopyrum smithii*
Bluebunch wheatgrass	*Agropyron spicatum*	*Elymus spicatus*	*Pseudoroegneria spicata*
Green needlegrass	*Stipa viridula*	*Stipa viridula*	*Nassella viridula*
Needle–and–thread grass	*Stipa comata*	*Stipa comata*	*Hesperostipa comata*
Sandberg's Bluegrass	*Poa juncifolia*	*Poa juncifolia*	*Poa secunda*

PHYSICAL SETTING

The Lund Easement is located 40 miles northwest of Havre at the western end of Wild Horse Lake, a giant depressional wetland associated with the temporarily flooded lake basin (**Figure 1**). The lake and surrounding lands are part of the Prairie Pothole region of Montana: wetlands typically associated with a wide range of diversity in plant, animal and aquatic life. The easement property consists of approximately 3,212 acres, largely within the historic lakebed on the north and east and to the south, uplands along Spring Coulee Ridge.

Western Wheatgrass

A few pothole depressions are scattered throughout the easement. The lake bottom is an extensive flat closed basin with areas of large unvegetated mud flats. During periods of high precipitation and snowmelt, surface water from the north drains into the basin and the lake fills to form an ephemeral, or vernal lake. Sage Creek, drains into Wild Horse Lake from the northwest.

The rolling to flat topography provides elevation ranges from 2790 feet in the lakebed to 2871 feet on a low ridge to the south and 2886 feet on the Spring Coulee Ridge to the west. Soils are of the Cretaceous Montana Group and were deposited 83 to 64 million years ago when two Cretaceous seas retreated (Veseth and Montagne, 1980). Drainage is poor to moderate on flat sites. Fine-to medium textured soils derived from alluvium, with shale, clay, mudstone and siltstone interspersed throughout, support a wide range of grasses, sedges and shrubs (Veseth and Montagne, 1980).

Over a forty-year period, mean temperatures ranged from 14 degrees in January to 70 degrees in August. The area receives an average of 10 to 15 inches of precipitation a year with 20%-30% as snow (Nesser et al, 1997).

VEGETATION DESCRIPTION

Needle-and Thread - Blue Grama - Thread-leaved sedge

The vegetation on the Lund Easement is characteristic of the Montana Glaciated Plains landscape. The uplands, which are largely sandy and thin silty ecological sites, are dominated by Needle-and-Thread - Blue Grama Herbaceous Vegetation *(Stipa comata - Bouteloua gracilis - Carex filifolia*). Two short grass species, thread-leaved sedge (*Carex filifolia)* and Sandberg's bluegrass (*Poa secunda*) switch in understory dominance throughout this type. Patches of Prairie Sandreed - Sedge Prairie Herbaceous Vegetation *(Calamovilfa longifolia - Carex inops spp. heliophilia*) occur on sandy upper-slope positions. Isolated potholes have higher clay content and contain one or a combination of western wheatgrass (*Pascopyrum smithii*), common spike rush (*Eleocharis palustris*), or clustered field sedge (*Carex praegracilis*) Herbaceous Vegetation communities. The lake basin experiences flooding during extremely wet years leaving extensive areas of sparsely vegetated mud flats. Black Greasewood / Western Wheatgrass - Shrub Herbaceous Vegetation *(Sarcobatus vermiculatus / Pascopyrum smithii*) forms an extensive shrub community in the Wild Horse Lake basin. On the Lund Easement, western wheatgrass is by far the dominant natural community and grows as a near monoculture over hundreds of acres.

Black Greasewood / Western Wheatgrass

The lakebed is periodically interrupted by sloughs, old overflow or stream meanders, that contain linear patches of common spike rush. The wettest location on the easement is located along the northern boarder with Canada; this wetland includes a tufted hairgrass (*Deschampsia cespitosa)* Herbaceous community.

KEY ENVIRONMENTAL FACTORS

Wild Horse is an extensive closed lake basin. During periods of high precipitation and show melt, surface water from the north drains into the basin; when water is abundant, the lake fills to form an ephemeral, or vernal lake. Wetlands and associated obligate wetland vascular species are associated with Grassy Lake, Sage Creek and it's tributaries as well as overflow ditches and culverts placed to drain meadows during periods of excess water.

The region experiences extremes in drought and flooding.

BIODIVERSITY VALUES

- **Mammals**

We detected 10 mammal species during our inventory (**Table 3**). Another species, Sagebrush Vole, was reported by Dennis Flath (personal communication). None are state Species of Concern (Carlson, 2001), but Pygmy Shrew (*Sorex hoyi*) is a state Species on Review requiring more data to determine its status. A partial skull of a Pygmy Shrew was found with remains of a Meadow Vole *(Microtus pennsylvanicus*) in an old raptor pellet below a fence line in Section 8. The record represents a range extension of over 300 km E in Montana, as well as a record filling a large northward hiatus into Canada between the Rocky Mountains to the west and North Dakota and Saskatchewan to the east and northeast (Hendricks 2001). The shrew may have been carried into the Lund Easement from one of the montane uplands (Sweet Grass Hills, Bears Paw Mountains, Cypress Hills), as this species is most often found in dry conifer forest (Foresman 2001a).

Table 3. Mammals detected in the Wild Horse Lake study area. Documentation codes following species names are sight record (S), capture record (C), or remains (R)

Pygmy Shrew (*Sorex hoyi*)	R
White-tailed Jackrabbit (*Lepus townsendii*)	S
Mountain Cottontail (*Sylvilagus nuttallii*)	S
Olive-backed Pocket Mouse (*Perognathus fasciatus*)	C
Sagebrush Vole (*Lemmiscus curtatus*)	C (D. Flath pers. comm.)
Meadow Vole (Microtus pennsylvanicus)	R
Northern Grasshopper Mouse (*Onychomys leucogaster*)	C
Deer Mouse (Peromyscus maniculatus)	C, R
Richardson's Ground Squirrel (*Spermophilus richarsonii*)	S, C
Coyote (*Canis latrans*)	S, R
Pronghorn (Antilocapra americana)	S

We trapped 22 individuals of four small mammal species (**Table 1**); 16 of the captures were in sagebrush habitat. The Deer Mouse was the most abundant and widespread species (18 individuals from 7 trap lines). Dennis Flath (personal communication) captured 28 small mammals on 7 August 1979 in "saline lowland range type" in the SE part of Section 10: 26 individuals were Deer Mice and two were Sagebrush Voles. In 2000 and 2001, we captured no voles of the genus *Microtus*, and runways were absent in the grassland habitats we examined. Voles may have been at a low in their multi-year population cycle, or the drought may have eliminated voles from the vicinity of Wild Horse Lake at the time of our inventory. The single Meadow Vole (*Microtus pennsylvanicus*) we documented (in a raptor pellet), may have been carried to the Lund Easement with the Pygmy Shrew from another locality.

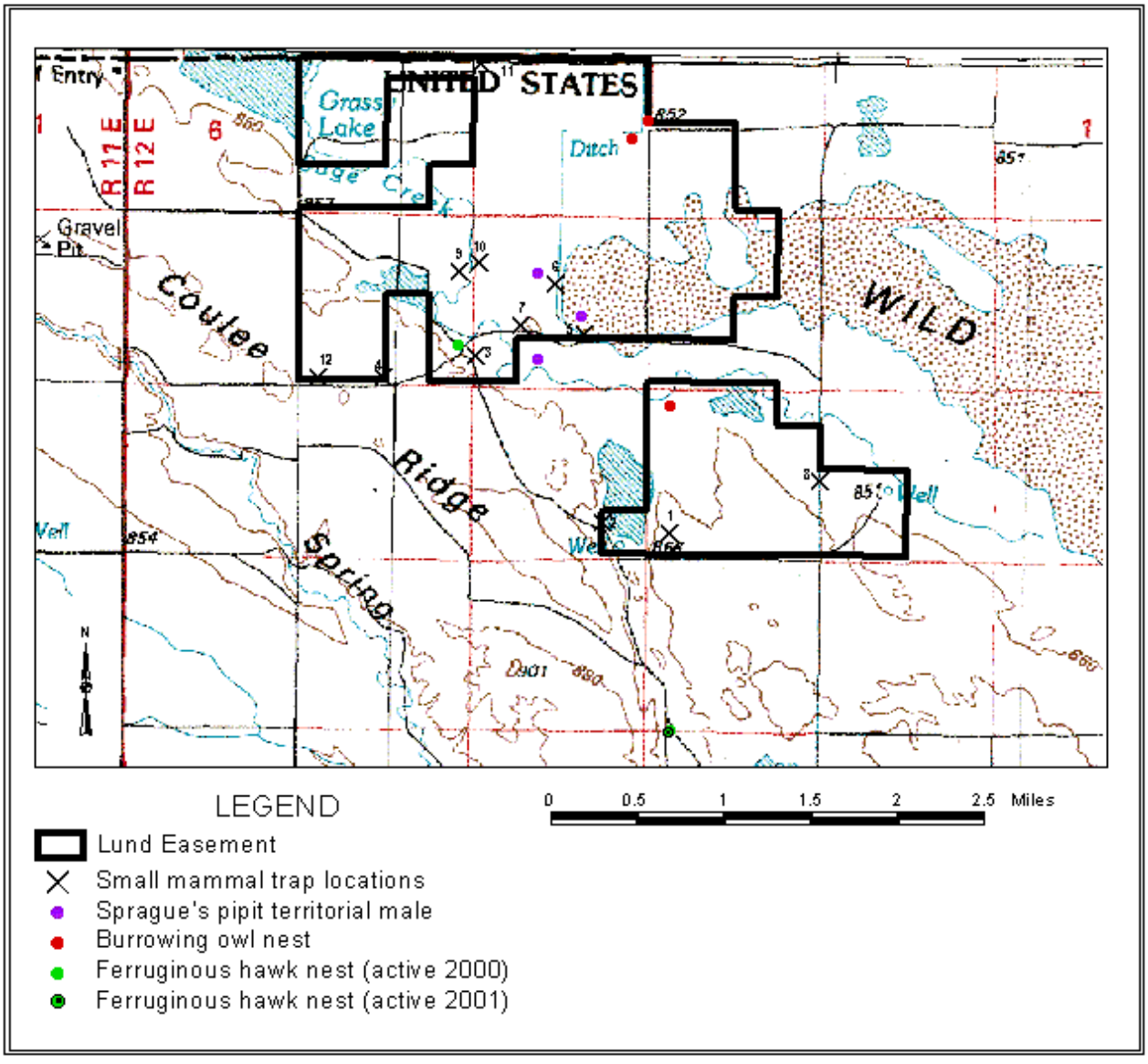
- **Birds**

We documented 43 bird species on the Lund Easement and in adjacent areas (Appendix A). Of these, 17 species were confirmed breeding, 9 were probably breeding, and 17 species exhibited no evidence of breeding, although most of the species in this last group undoubtedly breed in the area. The list of species is by no means complete, as the lack of surface water contributed to the relatively few waterbird and shorebird species we observed, as did limited field time at the study site. Extreme drought conditions may have contributed to the absence of some passerine species as well, such as Baird's Sparrow and Grasshopper Sparrow that favor at least some moderately tall (15-40 cm) standing grass (Madden et al, 2000). These two sparrows, one a Species of Concern and, the other on the state Species of Potential Concern list due to declining trend, should be looked for during years of normal or above average precipitation. Both species are local but widespread throughout northeastern Montana (Montana Bird Distribution Committee, 1996).

Bird species observed in the study area represent an avifauna typical of northern prairie grasslands in North America, and included three species (Sprague's Pipit, McCown's Longspur, Chestnut-collared Longspur) endemic to the Northern Great Plains. Seven bird species, all confirmed or probable breeders in the study area in 2000-2001, are on the state Species of Potential Concern list due to declining trends (Appendix A). Another three bird species (Ferruginous Hawk, Burrowing Owl, and Sprague's Pipit) are state Species of Concern (Carlson, 2001).

Ferruginous Hawk: One tree nest was found in July 2000 at the abandoned residence in Section 8. Although not active at the time, recent whitewash, pellets, and tail feathers identified the nest as belonging to this species and recently active. Two different birds were observed soaring over the area. In May 2001 an active nest was found in the windbreak in Section 22 south of the Lund Easement (**Figure 2**). An incubating or brooding adult flushed from the nest on 27 May, but nest contents were not checked. It is likely that these two nest sites represent one nesting territory.

Figure 2. Bird nest and small mammal trap locations

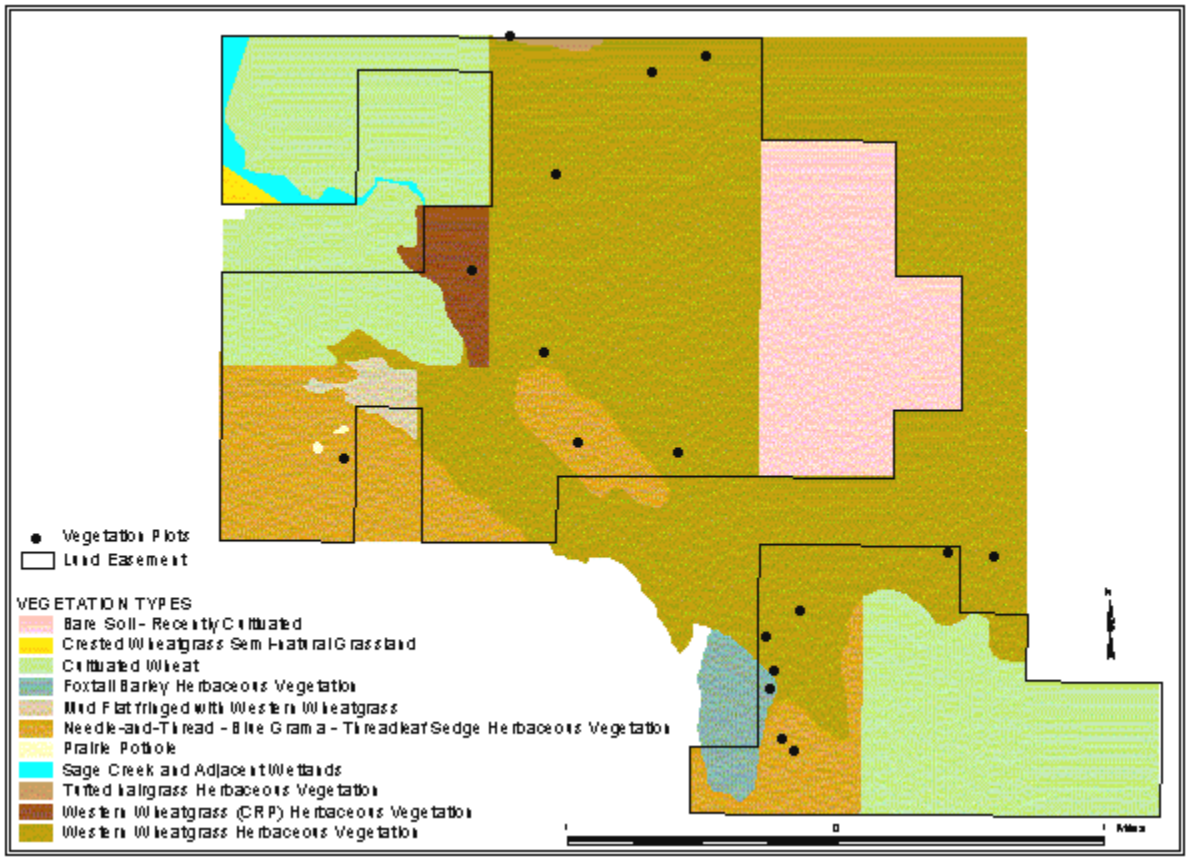


Burrowing Owl: Two nests in ground squirrel burrows were found in July 2000. One adult and one chick were observed at the nest in Section 15, two adults and nine chicks were observed at the nest in Section 4. In May 2001 a pair of adults was active in the general vicinity of the 2000 nest in Section 4. Following a brief observation period one of the adults entered a ground squirrel burrow along the NW edge of Section 3 and remained below ground. Accumulated pellets and whitewash indicated this site was an active nest, probably occupied by the pair of owls that nested in Section 4 the previous year.
Sprague's Pipit: Five territorial males were observed performing aerial song displays during 18-20 July over an extensive portion of dry lakebed in Section 9 where there was dense grass and sedge cover of moderate height (about 20 cm). This area seemed even drier in May 2001 (no green vegetation), and no pipits were seen or heard during that visit.

- **Natural Communities**

In all, twelve terrestrial plant communities were documented in the Lund easement. The greasewood / western wheatgrass *(Sarcobatus vermiculatus / Pascopyrum smithii*) Shrub Herbaceous community is perhaps the most extensive in the state of Montana; it is found throughout the Wild Horse Lake basin with the greatest area on neighboring land managed by the Bureau of Land Management. **Figure 3** illustrates the dominant vegetation communities on the easement.

Figure 3. Plant associations on the Lund Easements



Two uncommon plant communities were recorded; the first, a silver sage / needle-and-thread grass (*Artemisia cana / Hesperostipa comata*) Shrub Herbaceous Vegetation was noted along the eastern edge of the ephemeral lake bottom at T37N R12E Section 15. This shrub prairie association occurs in small patches and has a very narrowly circumscribed geographic distribution in the northwestern Great Plains.

This vegetation type grows on well-drained benches and gently inclined landforms and has put this community at moderate risk of conversion to agricultural crops in farming landscapes. The other uncommon plant community is the Prairie Sandreed - Sedge Prairie Herbaceous Vegetation (*Calamovilfa*

Prairie - Sandreed - Thin-leaved Sedge

longifolia - Carex inops spp. heliophilia). This community is also confined to the northwestern Great Plains of the United States and Canada. Stands typically occur on gentle slopes but can also be found on flat land or moderate to steep slopes. Soils are thin sands, sandy loams, and loamy sands, in places derived from sandstone. On the Lund easement, this type occurs as small patches on sandy ecological sites elevated above the lake basin and is codominated by thread-leaved sedge (*Carex filifolia*) rather than sun sedge. **Table 4** lists all twelve communities and gives the state and national rank. Complete community association and alliance descriptions are found in Appendix B.

Table 4. Plant Associations documented in the Lund Easement

Scientific Name	State Rank	Global Rank
Agropyron cristatum Semi-natural Herbaceous Vegetation Crested Wheatgrass Semi-natural Grassland	SC	GC
Artemisia cana / Hesperostipa comata Shrub Herbaceous Vegetation Silver Sage/ Needle-and-thread	S3	G3
Calamovilfa longifolia - Carex inops spp. heliophilia Herbaceous Vegetation Prairie Sandreed - Sedge Prairie Herbaceous Vegetation	S3	G3
Carex praegracilis Herbaceous Vegetation Clustered Field Sedge Herbaceous Vegetation	S?	G3G4
Deschampsia cespitosa Herbaceous Vegetation Tufted Hairgrass Herbaceous Vegetation	S4	G4
Eleocharis palustris Herbaceous Vegetation Marsh Spikerush Herbaceous Vegetation	S5	G5
Hordeum jubatum Herbaceous Vegetation Foxtail Barley Herbaceous Vegetation	S4	G4
Pascopyrum smithii Herbaceous Vegetation Western Wheatgrass Herbaceous Vegetation	S4	G3G5Q
Poa secunda Herbaceous Vegetation Sandberg's Bluegrass Herbaceous Vegetation	S?	G4?
Sarcobatus vermiculatus / Pascopyrum smithii Shrub Herbaceous Vegetation Black Greasewood / Western Wheatgrass - Shrub Herbaceous Vegetation	S4	G4
Sarcobatus vermiculatus Shrubland Black Greasewood Shrubland	S?	G5
Stipa comata - Bouteloua gracilis - Carex filifolia Herbaceous Vegetation Needle-and-Thread - Blue Grama Herbaceous Vegetation	S?	G5

- **Plants**

No plants of concern were noted during the inventory in 2000, however there are several plants tracked by the Montana Natural Heritage program that may occur on the easement. These plants are mostly annuals associated with moist areas. Surveys scheduled for 2000 and 2001 were cancelled due to severe drought in the region.

OTHER VALUES

Wetlands in northern Hill Co. have been mapped by the FWS as part of the National Wetland Inventory. Wild Horse Lake, Grassy Lake. Sage Creek and scattered potholes are mapped as Palustrine wetlands (Cowardin et al, 1979) that are temporarily or seasonally flooded. An interesting and diverse mesic wet meadow is found along the Canadian border in the western portion of the easement. This wetland includes a tufted hairgrass herbaceous community (*Deschampsia cespitosa)* intermixed with western wheatgrass.

Tufted Hairgrass

Windbreaks of Caragana (*Caragana arborescens)* and shade trees planted at the old homestead site provide structural diversity and nesting habitat for prairie birds.

LAND USE

Land use is primarily ranching and farming. Agricultural treatments are numerous; many acres of semi-natural vegetation are planted in crested wheatgrass (*Agropyron cristatum*) and many acres are planted as crop wheat. Portions of the old lakebed have been planted to western wheatgrass as part of the Conservation Reserve Program.

The hydrology of the lake basin has been highly modified. A series of dams, dikes, drainage and spreader ditches contain and control water during seasons of high water. Otherwise the lake basin is arid and lacks permanent water. On the easement, at least three water developments (wells) are in place, although it is not known if any of these still yield water.

EXOTICS

One noxious weed and several exotic plants, some of which are known to increase and invade natural communities are found on the easement. Unfortunately the noxious weed, Canada thistle *(Cirsium arvense*), is very abundant around overflow culverts and drainages ditches that are used to drain hay meadows during periods of excess water. Other notable introduced exotic species include smooth brome (*Bromus inermis*), reed canary grass (*Phalaris* arundinacea), common tansy (*Tanacetum vulgare*), great ragweed (*Ambrosia trifida*), and wild licorice *(Glycyrrhiza lepidota).*

UPLANDS

Ranching and farming occur on adjacent private property. Rangelands managed by the Bureau of Land Management occur east of the property and State Trust Lands found at T37N, R12E Section 16 are used as cattle allotments.

INFORMATION NEEDS

Additional surveys are needed to complete the mammal and bird inventories. The study area falls within the range of two globally rare species on the state Species of Concern List, the G3 Swift Fox (*Vulpes velox*) and the G2 Mountain Plover (*Charadrius montanus*). Swift Fox has been reported in recent years in Hill County (Foresman, 2001a) and has reoccupied portions along the Canadian border (Jody Peters personal communication). The Mountain Plover has been reported breeding in Canada only in adjacent portions of Alberta and Saskatchewan near the international border (Wallis and Wershler, 1981). Although there are no reports from Montana in the vicinity of Wild Horse Lake, the study area deserves to be thoroughly surveyed for this bird species. These species aside, additional small mammal trapping is recommended to determine the presence or absence of Pygmy Shrew in the area. Bird surveys during years of normal or above normal precipitation are also recommended to identify the wetland species using the site when surface water is present. Currently this is largely unknown.

Baseline inventory for plants of concern should take place during a wet year. Eight annual and one perennial plant species that are wetland obligate or facultative wetland species (Reed, 1996) were identified to have potential habitat on the easement (Heidel, personal communication). These species are listed in **Table 5**. Species descriptions including distinguishing characteristics and habitat are available on the Montana Natural Heritage Program World Wide Web page (MTNHP, 2001).

Table 5. Plant species of concern that may potentially occur on the Lund Easement

Common name followed by Scientific name	Wetland rating[1]	Global Rank	State Rank
California Waterwort *Elatine californica* Gray	OBL	G5	SU
Dense-flower Knotweed *Polygonum polygaloides ssp confertiflorum*	FACW+, OBL	G4G5T3T4	SU
Dwarf Wooly-heads *Psilocarphus brevissimus var brevissimus*	FACW+, OBL	G5T?	S2
Guadalupe Water-nymph *Najas guadalupensis* (Spreng.) Magnus	OBL	G5	S1
Hutchinsia *Hutchinsia procumbens* (L.) Desv	FAC	G5	S1
Poison Suckleya *Suckleya suckleyana* (Torr.) Rydb	FAC, OBL	G5	SU
Roundleaf Water-hyssop *Bacopa rotundifolia* (Michx.) Wettst.	OBL	G5	S1
Scarlet Ammannia *Ammannia coccinea* Rottb.	OBL	G5	SH
Short-seeded Water-wort *Elatine brachysperma* Gray	FACW, OBL	G5	SU
Slender Bulrush *Scirpus heterochaetus* Chase	OBL	G5	S1
Slender-branched Popcorn-flower *Plagiobothrys leptocladus* (Greene) I.M. Johnston	FACW, OBL	G4	S1

[1] Obligate Wetland (OBL): Species that occur almost always (estimated probability >99%) under natural conditions in wetlands.
Facultative Wetland (FACW): Species that usually occur in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.
Facultative (FAC): Species that are equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).

MANAGEMENT NEEDS

Maintaining diversity of native prairie cover and structure through appropriate rotational grazing techniques and prescribed fire on upland areas will help assure the continued presence of a relatively complete grassland bird fauna whose nesting habitat and vegetation-structure requirements vary among species. Studies to determine the effects of landscape patch size on breeding success of these species would also be useful. It would also be useful to develop models predicting the impact of water impoundment on species that currently use the dry lakebed for nesting.

A strategic weed management plan is needed to treat Canada thistle before this noxious weed (Rice, 2001) invades less disturbed natural communities on the easement. Canada thistle is an aggressive, creeping perennial weed that invades cultivated fields, natural hay meadows and prairies and reduces forage consumption. An integrated long-term control plan designed to stress the plant and force it to use stored root nutrients is suggested. An integrated approach utilizes a combination of cultural, chemical, mechanical and biological methods.

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Appendix A.

Birds observed in the Wild Horse Lake study area, Hill County, Montana. Breeding status codes are as follows: O (no evidence of breeding), b (strong evidence of breeding; territorial behavior, pairs, juveniles), B (breeding confirmed; nests found, dependent young). Species common names in **bold** are Montana Species of Concern; species common names in *italics* are on the Species of Potential Concern List due to declining trends (Carlson, 2001). Names and sequence follow the A.O.U. Checklist, 7th edition (1998).

Canada Goose (*Branta canadensis*)	O (flyover; 2001)
Mallard (*Anas platyrhynchus*)	O (2001)
Northern Harrier (*Circus cyaneus*)	O (2000, 2001)
Swainson's Hawk (*Buteo swainsoni*)	B (2 nests; 2000, 2001)
Red-tailed Hawk (*Buteo jamaicensis*)	O (2000, 2001)
Ferruginous Hawk (*Buteo regalis*)	B (2 nests; 2000, 2001)
Golden Eagle (*Aquila chrysaetos*)	O (2001)
Prairie Falcon (*Falco mexicanus*)	O (2000)
Ring-necked Pheasant (*Phasianus colchicus*)	O (2000)
Sharp-tailed Grouse (*Tympanuchus phasianellus*)	b (2 immatures; 2000)
Killdeer (*Charadrius vociferus*)	B (downy young; 2001)
Willet (*Catoptrophorus semipalmatus*)	O (2001)
Upland Sandpiper (*Bartramia longicauda*)	O (2000, 2001)
Long-billed Curlew (*Numenius americanus*)	b (pair; 2001)
Marbled Godwit (*Limosa fedoa*)	O (2001)
Wilson's Phalarope (*Phalaropus tricolor*)	O (2001)
Mourning Dove (*Zenaida macroura*)	B (10 nests in wind break; 2001)
Great Horned Owl (*Bubo virginianus*)	B (adult + downy chick; 2001)
Burrowing Owl (*Athene cunicularia*)	B (3 nests, incl. broods; 2000, 2001)
Short-eared Owl (*Asio flammeus*)	O (2000)
Common Nighthawk (*Chordeiles minor*)	O (2000, 2001)
Say's Phoebe (*Sayornis saya*)	O (2000, 2001)
Western Kingbird (*Tyrannus verticalis*)	O (2000, 2001)
Eastern Kingbird (*Tyrannus tyrannus*)	B (nest with eggs; 2000)
Loggerhead Shrike (*Lanius ludovicianus*)	B (1 brood; 2000: 2 nests; 2001)
Horned Lark (*Eremophila alpestris*)	b (fledged young; 2000, 2001)
Barn Swallow (*Hirundo rustica*)	B (nests in buildings; 2000, 2001)
Brown Thrasher (*Toxostoma rufum*)	O (in wind break; 2001)
European Starling (*Sturnus vulgaris*)	B (3 nests in wind break; 2001)
Sprague's Pipit (*Anthus spragueii*)	b (5 territorial males; 2000)
Clay-colored Sparrow (*Spizella pallida*)	b (singing males; 2001)
Brewer's Sparrow (*Spizella breweri*)	B (dependent fledglings; 2000)
Vesper Sparrow (*Pooecetes gramineus*)	B (nest with eggs; 2001)
Lark Sparrow (*Chondestes grammacus*)	b (singing males; 2001)
Lark Bunting (*Calamospiza melanocorys*)	B (2 nests with eggs or young; 2000)
Savannah Sparrow (*Passerculus sandwichensis*)	B (nest with young: 2000)
McCown's Longspur (*Calcarius mccownii*)	b (singing males; 2000, 2001)
Chestnut-collared Longspur (*Calcarius ornatus*)	B (nest with eggs; 2001)
Red-winged Blackbird (*Agelaius phoeniceus*)	b (singing males; 2001)
Western Meadowlark (*Sturnella neglecta*)	b (singing males; 2000, 2001)
Brewer's Blackbird (*Euphagus cyanocephalus*)	B (10 nests in wind break; 2001)
Common Grackle (*Quiscalus quiscula*)	O (2001)
Brown-headed Cowbird (*Molothrus ater*)	B (juv. with Lark Bunting; 2000)

INTERNATIONAL CLASSIFICATION OF ECOLOGICAL COMMUNITIES:

TERRESTRIAL VEGETATION OF THE UNITED STATES

Wild Horse Lake: Lund Easement

Report from
Biological Conservation Datasystem
September, 2001

by

Association for Biodiversity Information

1101 Wilson Blvd., 15th floor
Arlington, VA 22209

This subset of the International Classification of Ecological Communities (ICEC) covers vegetation alliances and associations attributed to the Hill County, Montana**.** This community classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications.

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III.A.4.N.c. Temporarily flooded microphyllous shrubland

III.A.4.N.c.2. ARTEMISIA CANA TEMPORARILY FLOODED SHRUBLAND ALLIANCE
Silver Sagebrush Temporarily Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: This alliance is found in the northwestern Great Plains and interior northwestern United States. This description is based largely on the type within this alliance that occurs in North and South Dakota. Stands of this alliance are found predominantly on floodplains or flat terraces near watercourses. The soils are derived from alluvial deposits and are often not well-developed. They are almost always loams, either sandy loams, silt loams, or clay loams. Flooding may occur periodically. Stands within this alliance are dominated by shrubs and graminoids approximately 1 m tall. Total vegetation cover is moderate. Graminoids make up the majority of the canopy, but the shrub layer is taller and thus more noticeable. *Artemisia cana* is the dominant, and often only, shrub in this stratum. *Symphoricarpos occidentalis* is present to common in some stands. There are also shorter shrubs such as *Artemisia frigida, Krascheninnikovia lanata, Rosa woodsii*, and *Gutierrezia sarothrae*. These rarely exceed 0.5 m. The most abundant midgrass in the Midwest is *Pascopyrum smithii*, with smaller amounts of *Nassella viridula*, *Hesperostipa comata (= Stipa comata), Koeleria macrantha*, and *Poa pratensis*. The shortgrass *Bouteloua gracilis* is usually present and may be very common. Forbs are present but do not contribute much of the vegetation cover in this alliance. Among the forbs that are typically found in this alliance are *Achillea millefolium, Gaura coccinea, Sphaeralcea coccinea, Lactuca tatarica* var. *pulchella*, and *Taraxacum officinale*.

Environment: These shrublands occur throughout the northern half of the Intermountain West, usually at middle elevations (1000-2500 (3000) m), and into the northern Great Plains at 500-1000 m in elevation. Across the range of the alliance there is great variation in precipitation, with less than 25 cm in semi-arid basins of the western Great Basin. In the northwestern Great Plains this alliance is found on flat alluvial deposits on floodplains, terraces or benches, or alluvial fans. The soils are moderately deep to deep and either silt loam, clay loam, or sandy loam. Flooding may occur periodically and this tends to retard soil development. In the northern Great Basin (Oregon) stands are found in playas on sites that are flooded for several months during the winter and early spring but which rapidly dry up as the weather warms. Soils are saline. In more saline soils at slightly lower elevations on the playa, *Artemisia cana / Eleocharis palustris* and *Eleocharis palustris* communities occur. In general, these communities show an affinity for mild topography, fine to somewhat coarse alluvial soils, and some source of subsurface moisture.

Vegetation: This vegetation is reported from the northwestern Great Plains and interior northwestern United States. In all stands, *Artemisia cana* is the dominant, and often, only shrub, but *Ericameria nauseosa (= Chrysothamnus nauseosus)* is usually present. Other shorter shrubs may occur or even be common, including *Symphoricarpos occidentalis, Artemisia frigida, Rosa woodsii*, and *Gutierrezia sarothrae*. There is usually a well-developed graminoid layer, with cover often exceeding the cover of the shrub layer. The dominant species include *Pascopyrum smithii*, or *Poa secunda*. Other important grasses include *Distichlis spicata, Elymus elymoides, Nassella viridula, Hesperostipa comata (= Stipa comata), Bouteloua gracilis, Koeleria macrantha*, or *Eleocharis palustris*. Forbs are present but do not contribute much of the vegetation cover. Among the forbs that are typically found in Great Plains stands are *Achillea millefolium, Gaura coccinea, Sphaeralcea coccinea*, and *Lactuca tatarica* var. *pulchella*. In Oregon stands, forbs include *Lupinus argenteus, Trifolium gymnocarpon, Astragalus lentiginosus, Polyctenium fremontii*, and *Camissonia tanacetifolia*.

Dynamics: These communities occur in mild alluvial terrain which is often grazed by domestic livestock and is strongly preferred during the growing season (Padgett et al. 1988). Prolonged livestock use of these habitats can cause decreases in the abundance of native bunch grasses and increases in cover of shrubs and non-native species, such as *Poa pratensis*.

Artemisia cana resprouts vigorously following spring fire, and this method may serve to increase shrub coverage of stands. Conversely, fire in the fall may decrease shrub abundance (Hansen et al. 1995). Sarr (1995) noted that *Artemisia cana* was associated with higher floodplain terraces of alluvial meadows where the late summer water table averaged 0.8-1.5 m below the surface. Gully erosion of meadows led to an invasion of this type to formerly wet meadows. Comparisons of grazed and protected floodplain sites showed a tendency for *Artemisia cana* to occur more commonly in grazed than ungrazed habitats of the similar groundwater hydrology.

ALLIANCE DISTRIBUTION

Range: This alliance is found in the western United States in Oregon, possibly Nevada, and Montana. One community extends into the northwestern Great Plains in the western portions of Nebraska, and North and South Dakota. The alliance probably also occurs in Alberta and Saskatchewan, Canada.
Nations: CA? US
States/Provinces: CA? MT ND NE NV? OR SD

USFS Ecoregions: 251Aa:CCC, 331D:CC, 331F:CC, 331G:CC, 342B:CC, 342C:CC, M331A:CC, M332B:C?, M332D:CC, M332E:CC, M332G:CC

ALLIANCE SOURCES

Authors: D. SARR, WCS **Identifier:** A.843
References: Chappell et al. 1997, Faber-Langendoen et al. 1996, Hansen et al. 1984, Hansen et al. 1991, Hansen et al. 1995, Hanson and Whitman 1938, Johnston 1987, Manning and Padgett 1991, Manning and Padgett 1995, Oregon Natural Heritage Program (ORNHP) n.d., Sarr 1995, U.S. Forest Service (USFS) 1992

ARTEMISIA CANA / PASCOPYRUM SMITHII SHRUBLAND

Silver Sagebrush / Western Wheatgrass Shrubland
Silver Sagebrush / Western Wheatgrass Shrubland

ELEMENT CONCEPT

Summary: This silver or coaltown sagebrush shrubland is found in the northwestern Great Plains and Rocky Mountains of the western United States. Stands occur on flat alluvial deposits on floodplains, terraces or benches, or alluvial fans. The soils are moderately deep to deep and either silt loam, clay loam, or sandy loam. Flooding may occur periodically and this tends to retard soil development. This community is dominated by a combination of shrubs and graminoids. The total vegetation cover is moderate. The tallest and most conspicuous stratum in this community is a shrub layer that is usually 0.6-1.2 m. *Artemisia cana* is the dominant in this layer and may be accompanied by *Symphoricarpos occidentalis*. Also present are shorter shrubs such as *Artemisia frigida, Krascheninnikovia lanata, Rosa woodsii*, and *Gutierrezia sarothrae*. The most abundant graminoid is *Pascopyrum smithii*. This species is typically 0.5-1.0 m tall. It is often accompanied by *Nassella viridula* and sometimes *Koeleria macrantha, Poa pratensis*, and *Hesperostipa comata (= Stipa comata). Bouteloua gracilis* is the most abundant short graminoid. Typical forb constituents of this community are *Achillea millefolium, Gaura coccinea, Sphaeralcea coccinea*, and *Lactuca tatarica* var. *pulchella*.

Environment: This community occurs on flat alluvial deposits on floodplains, terraces or benches, or alluvial fans. The soils are moderately deep to deep (USFS 1992) and either silt loam, clay loam, or sandy loam (Johnston 1987, Hansen and Hoffman 1988). The soils may have moderate salt content (Hanson and Whitman 1938). Flooding occurs periodically and this tends to retard soil profile development (Hirsch 1985).

Vegetation: This community is dominated by a combination of shrubs and graminoids. The total vegetation cover is typically moderate, but depends on frequency of flooding. The tallest and most conspicuous stratum is a shrub layer that is usually 0.6-1.2 m (Hansen and Hoffman 1988). In 14 stands in western North Dakota shrubs averaged 28% canopy cover, graminoids 59%, and forbs 2% (USFS 1992). Stands in Nebraska often have less than 15% cover. The variation in soils within and between stands of this community results in variable species composition. *Artemisia cana* is the dominant shrub. *Symphoricarpos occidentalis* is frequently present. There are also shorter shrubs such as *Artemisia frigida, Krascheninnikovia lanata, Rosa woodsii*, and *Gutierrezia sarothrae*. The most abundant graminoid is *Pascopyrum smithii*. This species is typically 0.5-1.0 m tall. It is often accompanied by *Nassella viridula* and sometimes *Koeleria macrantha, Poa pratensis*, and *Hesperostipa comata (= Stipa comata). Bouteloua gracilis* is the most abundant short graminoid. Typical forb constituents of this community are *Achillea millefolium, Gaura coccinea, Sphaeralcea coccinea*, and *Lactuca tatarica* var. *pulchella*.

Dynamics: Periodic flooding occurs in many stands of this community.
Similar Associations:
Synonymy:

- *Artemisa cana / Agropyron smithii* Habitat Type (Hansen et al. 1984) =
- *Artemisia cana* Habitat Type (Hirsch 1985) =
- Sagebrush Type (Hanson and Whitman 1938) =

- *Artemisa cana / Elytrigia smithii* Plant Association (Johnston 1987) B
- *Artemisa cana - Symphoricarpos occidentalis / Elytrigia smithii* Plant Association (Johnston 1987) =
- *Artemisa cana / Agropyron smithii* Habitat Type (U.S. Forest Service (USFS) 1992) =

GRank & Reasons: G4 (96-02-01).
High-ranked species:
Comments: See Steinauer and Rolfsmeier (2000) for a description of the stands in Nebraska.

ELEMENT DISTRIBUTION

Range: This silver or coaltown sagebrush shrubland is found in the northwestern Great Plains and Rocky Mountains of the western United States, ranging from Montana and North Dakota, south to Nebraska.
Nations: US
States/Provinces: MT:S4, ND:S2S3?, NE:S?, SD:SU
USFS Ecoregions: 251Aa:CCC, 331D:CC, 331F:CC, 331G:CC, M331A:CC, M332B:C?, M332D:CC, M332E:CC, M334A:CC

ELEMENT SOURCES

Authors: Drake, J. F., WCS **Confidence:** 1 **Identifier:** CEGL001072
References: Hansen and Hoffman 1988, Hansen et al. 1984, Hansen et al. 1991, Hansen et al. 1995, Hanson and Whitman 1938, Hirsch 1985, Johnston 1987, Nelson 1961, Steinauer and Rolfsmeier 2000, U.S. Forest Service (USFS) 1992

III.B.3.N.b. Intermittently flooded extremely xeromorphic deciduous subdesert shrubland

III.B.3.N.b.3. SARCOBATUS VERMICULATUS INTERMITTENTLY FLOODED SHRUBLAND ALLIANCE

Black Greasewood Intermittently Flooded Shrubland Alliance

ALLIANCE CONCEPT

Summary: This widespread shrubland alliance occurs on lowland sites in plains, mountain valleys and intermountain basins throughout the arid and semi-arid western United States. Sites are generally flat, poorly drained and intermittently flooded with a shallow or perched water table often within 1 m depth such as alkali flats around playas and floodplains along stream channels. Substrates are generally shallow, calcareous, fine-textured soils derived from alluvium. Soils are alkaline and typically moderately saline. Shrublands included in this alliance are dominated or codominated by *Sarcobatus vermiculatus*. Other shrubby codominants include *Picrothamnus desertorum (= Artemisia spinescens), Artemisia tridentata, Atriplex confertifolia, Atriplex gardneri, Chrysothamnus* spp., or *Grayia spinosa*. In more saline environments, *Nitrophila occidentalis* and *Suaeda moquinii* may be present. If present, the sparse to moderate herbaceous layer is dominated by perennial grasses, such as *Distichlis spicata* and *Pascopyrum smithii*, or the perennial bunch grasses *Elymus elymoides, Hordeum jubatum, Leymus cinereus*, and *Achnatherum hymenoides (= Oryzopsis hymenoides)* will dominate. Perennial forbs are typically sparse and often include *Grindelia squarrosa, Iva axillaris*, and *Sphaeralcea coccinea*. Annual grasses, especially the exotic *Bromus* spp., may be present to abundant. Forbs are common on disturbed sites. Weedy annual forbs may include the exotics *Descurainia* spp., *Helianthus annuus, Halogeton glomeratus, Lactuca serriola*, and *Lepidium perfoliatum*. Diagnostic of this alliance is the *Sarcobatus vermiculatus*-dominated shrub layer in a shrubland that has a relatively shallow water table and may be flooded intermittently during the growing season.

Environment: Shrublands included in this alliance occur on lowland sites in plains, mountain valleys and intermountain basins throughout the arid and semi-arid western United States. Elevations range from 100-2400 m. Summers are hot. Winters are generally cold, but are mild in subtropical regions. Precipitation varies with geography but is generally low and infrequent. Sites are generally flat, poorly drained and intermittently flooded with a shallow or perched water table often within 1 m depth (West 1983b). Substrates are generally shallow, calcareous, fine-textured soils (clays to silt-loams), derived from alluvium. Soils are alkaline and typically moderately saline (West 1983b).

Adjacent upland vegetation depends on geography. In the Great Plains, it is likely shortgrass or midgrass prairie. In the Great Basin and central Wyoming, upland vegetation is typically *Artemisia* spp.- or *Grayia spinosa*-dominated shrublands. In the Mojave and other warm desert sites, *Larrea tridentata, Grayia spinosa*, or *Atriplex* spp. dominate the upland sites. In the California Central Valley adjacent upland vegetation is dominated by *Atriplex* spp. with annual grasses. Lowland vegetation is typically sparser stands of *Sarcobatus vermiculatus* or stands of species more tolerant of saline soils or poor soil aeration such as *Distichlis spicata, Allenrolfea occidentalis* or *Suaeda moquinii* (Franklin and Dyrness 1973, Young et al. 1986).

Vegetation: This widespread alliance includes shrublands from alkali flats around playas and floodplains along stream channels that dissect much of the arid and semi-arid western U.S. Stands have a moderately dense to dense woody layer (20-60% cover) dominated or codominated by the deciduous, facultative halophytic shrub *Sarcobatus vermiculatus*. Other shrubby codominants include *Picrothamnus desertorum (= Artemisia spinescens), Artemisia tridentata, Atriplex confertifolia, Atriplex gardneri, Chrysothamnus* spp. or *Grayia spinosa*. In more saline environments, *Nitrophila occidentalis* and *Suaeda moquinii* may be present. Herbaceous layers range from absent to a moderately dense canopy of medium-tall to short bunch grasses or sod grasses (0-25% cover). If the herbaceous layer is present, perennial grasses such as the strongly rhizomatous *Distichlis spicata* and *Pascopyrum smithii*, or the perennial bunch grasses *Elymus elymoides, Hordeum jubatum, Leymus cinereus*, and *Achnatherum hymenoides (= Oryzopsis hymenoides)* will dominate. Perennial forbs are typically sparse and often include *Grindelia squarrosa, Iva axillaris*, and *Sphaeralcea coccinea*. Annual grasses, especially the exotic *Bromus japonicus, Bromus rubens*, and *Bromus tectorum*, may be present to abundant. Forbs are common on disturbed weedy sites. Weedy annual forbs may include the exotics *Descurainia* spp., *Helianthus annuus, Halogeton glomeratus, Lactuca serriola*, and *Lepidium perfoliatum*.

Dynamics: *Sarcobatus vermiculatus*, like many facultative halophytes, is tolerant of alkaline and saline soil conditions that allow the species to occur in sites with less interspecific competition (Ungar et al. 1969, Branson et al. 1976). The shrub also occurs on extremely arid non-saline sites. *Sarcobatus vermiculatus* is often found on sites with high water tables that are intermittently flooded. Hansen et al. (1995) reported that it can tolerate saturated soil conditions for up to 40 days. *Sarcobatus*

vermiculatus-dominated vegetation can occur as a narrow band along a channel, or in a mosaic of communities where composition and density of the shrub and understory species vary with depth to water table, salinity and alkalinity, soil texture, and past land use or disturbance. Hanson (1929) described stands in south-central Colorado and found that pure stands of *Sarcobatus vermiculatus* and *Distichlis spicata* are more common on strongly saline/alkaline sites with fine-textured soil and shallow water tables, whereas stands with mixed shrubs such as *Chrysothamnus* or *Artemisia* are more common on drier, coarser textured, low-alkaline sites. Sporobolus airoides is found on dry, strongly alkaline sites, and *Pascopyrum smithii* is most common on less alkaline, moist, sites in low lying areas.

Sarcobatus vermiculatus is not ordinarily browsed, but Daubenmire (1970) found that under heavy stocking rates, the shrubs will develop a compact canopy. Hansen et al. (1995) also reported browsing damage with heavy spring and summer grazing, but noted that *Sarcobatus vermiculatus* is moderately poisonous to livestock especially in the fall, and supplemental feed is recommended to avoid livestock loss. Hanson (1929) states that *Sarcobatus vermiculatus* can form an important part of winter forage for sheep. Fire will topkill *Sarcobatus vermiculatus*, but the shrub will promptly resprout from the root crown (Daubenmire 1970).

NRCS range sites for the eastern plains of Colorado do not describe this alliance on good condition sites. Several range sites (Salt flat #33, Saline overflow #37) list *Sarcobatus vermiculatus* as present in low abundance in good condition stands but describe it as increasing with overgrazing. The NRCS range sites also describe *Bouteloua gracilis* increasing with overgrazing. Stands dominated by *Sarcobatus vermiculatus* with an understory dominated by *Bouteloua gracilis* been observed in eastern Colorado (S. Kettler pers. obs.).

ALLIANCE DISTRIBUTION

Range: Shrublands included in this alliance occur in floodplains along water courses and around pluvial lakes and playas throughout much of the arid and semi-arid western U.S.
Nations: US
States/Provinces: CA CO ID MT NM NV OR TX? UT WA WY
USFS Ecoregions: 313B:CC, 331D:CC, 331G:CC, 341A:CC, 341E:CC, 342A:CC, 342B:CC, 342C:CC, 342F:CC, 342G:CC, 342I:CC, M261G:CC, M313A:CC, M331B:??, M332E:CC, M332G:CC, M341:C

ALLIANCE SOURCES

Authors: K. SCHULZ, JT, WCS **Identifier:** A.1046
References: Barbour and Major 1977, Blackburn et al. 1969, Blackburn et al. 1969c, Blackburn et al. 1969d, Blackburn et al. 1971, Branson and Owen 1970, Branson et al. 1976, Brotherson et al. 1986, Brown 1982, Bundy et al. 1996, Chappell et al. 1997, Copeland 1979, Copeland and Greene 1982, Dastrup 1963, Daubenmire 1970, DeVelice and Lesica 1993, DeVelice et al. 1991, DeVelice et al. 1995, Dick-Peddie 1993, Fenemore 1970, Francis 1986, Franklin and Dyrness 1973, Graham 1937, Hamner 1964, Hansen et al. 1995, Hanson 1929, Holland 1986, Johnston 1987, Lesica and DeVelice 1992, Medicine Bow Mine Application n.d., Mueggler and Stewart 1980, Sawyer and Keeler-Wolf 1995, Sweetwater Uranium Project 1978, Terwilliger and Smith 1978, Tweit and Houston 1980, Ungar et al. 1969, West 1983b, Young et al. 1986

SARCOBATUS VERMICULATUS SHRUBLAND

Black Greasewood Shrubland

ELEMENT CONCEPT

Summary: Community description in preparation
Environment:
Vegetation:
Dynamics:
Similar Associations:
Synonymy:
GRank & Reasons: G5 (94-02-23).
High-ranked species:
Comments: Stands included in this association are often affected by livestock grazing.

ELEMENT DISTRIBUTION

Range:

Nations: US
States/Provinces: CA:S3?, NV:S?, UT:S5
USFS Ecoregions: 341:C, 342B:CC

ELEMENT SOURCES

Authors: WCS **Confidence:** 2 **Identifier:** CEGL001357
References: Brotherson et al. 1986, Dastrup 1963, Graham 1937, Young et al. 1986

V.A.5.N.c. Medium-tall sod temperate or subpolar grassland

V.A.5.N.c.29. HESPEROSTIPA COMATA - BOUTELOUA GRACILIS HERBACEOUS ALLIANCE

Needle-and-Thread - Blue Grama Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance is widespread across upland sites in the northern Great Plains. Its communities tend to be the climax communities on fertile dry-mesic sites across much of its range. It is dominated by mid and short grass species; woody species do not regularly achieve prominence. Few of the species exceed 1 m while many, including *Bouteloua gracilis*, do not exceed 50 cm. The most abundant species are *Hesperostipa comata (= Stipa comata)* and *Bouteloua gracilis*. On more mesic sites *Hesperostipa comata* is predominant, while on areas that are drier or subject to light grazing *Bouteloua gracilis* takes precedence. Other graminoid species that are commonly found in communities of this alliance are *Aristida purpurea* var. *longiseta (= Aristida longiseta), Carex duriuscula (= Carex eleocharis), Carex filifolia, Koeleria macrantha, Nassella viridula,* and *Pascopyrum smithii*. Sites in the southern half of the range of this alliance may have significant amounts of *Bouteloua curtipendula*. Forbs are common but not usually abundant. Forb species that are regularly found are *Artemisia frigida, Gaura coccinea, Gutierrezia sarothrae (= Gutierrezia diversifolia), Liatris punctata, Sphaeralcea coccinea (= Malvastrum coccineum), Phlox hoodii*, and *Sphaeralcea coccinea*. The clubmoss *Selaginella densa* is present in many stands in this alliance. Scattered shrubs are sometimes present. These include *Prunus virginiana, Rhus aromatica*, and *Symphoricarpos occidentalis*. In the western and southwestern portions of its range, *Cercocarpus montanus* may be found where this alliance occurs on slopes.

Communities in this alliance are found on flat to moderately steep topography. The soils are sandy loam, loam, or sometimes clay loam. They are often well-developed and derived from either glacial deposits or sometimes limestone or sandstone (Hanson and Whitman 1938, Coupland 1950, Hanson 1955).

Environment: Grasslands included in this alliance are common in the west-central and northwestern Great Plains. Elevations range from 600-2350 m. Climate is temperate, continental and semi-arid to subhumid. Mean annual precipitation ranges from 25-50 cm. The year-to-year variation is great, in both total annual precipitation and the proportion of precipitation occurring in the winter and spring versus summer.

Stands typically occur on upland sites in rolling plains, breaks, foothills, plateaus, xeric montane parklands and in smaller forest openings in mountains. Sites are flat to moderately steep slopes on any aspect. Soils are shallow to moderately deep, non-saline, often calcareous and alkaline, with sandy loam, loam or sometimes clay loam texture. Mountain substrates are typically coarser colluvial soils. Parent materials often include limestone, sandstone, or shale with glacial deposits in the northern Great Plains, and colluvium derived from granite, gneiss schist in the mountains.

Adjacent stands in the plains are often grasslands dominated by *Pascopyrum smithii* in mesic bottomlands and *Bouteloua gracilis* in the xeric plains and *Festuca idahoensis* in the mountains, shrublands dominated by *Artemisia tridentata, Ribes* spp. or *Rhus trilobata,* and woodlands dominated by *Pinus edulis, Pinus flexilis, Pinus ponderosa* or *Juniperus* spp.

Vegetation: These grasslands are widespread across upland sites in the northern Great Plains. Communities tend to be the late seral communities on fertile dry-mesic sites across much of its range (Tolstead 1941, Hansen et al. 1984). It is dominated by mid- and shortgrass species; woody species do not regularly achieve prominence. Few of the species exceed 1 m while many, including *Bouteloua gracilis*, do not exceed 50 cm. The most abundant species are *Hesperostipa comata (= Stipa comata)* and *Bouteloua gracilis*. On more mesic sites *Hesperostipa comata* is predominant, while on areas that are drier or subject to light grazing *Bouteloua gracilis* takes precedence. Other graminoid species that are commonly found in communities of this alliance are *Aristida purpurea* var. *longiseta (= Aristida longiseta), Carex duriuscula (= Carex eleocharis), Carex filifolia, Carex inops* ssp. *heliophila, Koeleria macrantha, Nassella viridula, Pascopyrum smithii* or *Poa secunda*. Sites in the southern half of the range of this alliance may have significant amounts of *Bouteloua curtipendula*. Forbs are common but not usually abundant (<10% cover). Forb species that are regularly found are *Antennaria parvifolia, Artemisia frigida, Allium textile, Eriogonum umbellatum, Gaura coccinea, Heterotheca villosa, Liatris punctata, Sphaeralcea coccinea (= Malvastrum coccineum), Phlox hoodii, Packera fendleri (= Senecio fendleri),* and *Sphaeralcea coccinea*. The clubmoss *Selaginella densa* is present in many stands in this alliance (Coupland 1950, DeVelice and Lesica 1995, Hansen et al. 1984). Scattered shrubs and dwarf-shrubs are sometimes present. These may include *Artemisia frigida, Gutierrezia* spp.,

Krascheninnikovia lanata, Prunus virginiana, Rhus trilobata, Rosa spp., and *Symphoricarpos occidentalis*. In the western and southwestern portions of its range, *Cercocarpus montanus* may be found where this alliance occurs on slopes (Hanson 1955).
Dynamics: These mixed grasslands occur in the subhumid/semi-arid steppes in the western Great Plains where high variability of precipitation, both seasonally and yearly allows both short and mid grasses to co-exist (Coupland 1992a).

Hesperostipa comata will decline with overgrazing, leaving the more grazing-tolerant *Bouteloua gracilis* to dominate (Laurenroth et al. 1994, Smoliak 1965, Smoliak et al. 1972).

Fire also can change the species composition of these grasslands. Burning generally kills or severely damages *Hesperostipa comata* plants. After fire, regeneration of this non-rhizomatous bunchgrass is through seed and may take many years to reach prefire densities (FEIS 1998). Burning *Bouteloua gracilis* during the growing season will topkill the plant, but the rhizomes are usually unharmed and quickly regrow (FEIS 1998). *Bouteloua gracilis* is usually unharmed by fires in years with above normal winter and spring precipitation (soil moisture prevents lethal soil temperatures), but it can be severely damaged by fires that occur during drought years (FEIS 1998).

Exotic species such as *Taraxacum officinale, Medicago sativa, Melilotus officinalis* or *Salsola kali* are present in some stands.

ALLIANCE DISTRIBUTION

Range: This alliance is found in the western Great Plains, from western Kansas to North Dakota, west into Colorado, Wyoming and Montana. The alliance also extends north into Canada in Saskatchewan, Manitoba, and probably Alberta.
Nations: CA US
States/Provinces: AB CO KS MB MT ND NE SD SK WY

USFS Ecoregions: 251Ab:CCC, 251Ba:CCC, 331C:CC, 331D:CC, 331E:C?, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 332C:CC, M331A:CC, M331H:CC, M331I:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC

ALLIANCE SOURCES

Authors: MCS, MOD. M.S. REID, MCS **Identifier:** A.1234
References: Aldous and Shantz 1924, Badaracco 1971, Bear Creek Uranium Mine Application n.d., Clements and Goldsmith 1924, Comer et al. 1999, Cooper et al. 1995, Cotter-Ferguson Project n.d., Coupland 1950, Coupland 1992a, Davis 1959, DeVelice et al. 1995, Faber-Langendoen et al. 1996, Fire Effects Information System (FEIS) 1998, Hansen 1985, Hansen and Hoffman 1988, Hansen et al. 1984, Hanson 1955, Hanson 1957, Hanson and Dahl 1956, Hanson and Whitman 1938, Hardy Ranch Mine Application n.d., Hess 1981, Hubbard 1950, Johnston 1987, Kuchler 1964, Laurenroth et al. 1994, Livingston 1947, Moir 1969, Mueggler and Stewart 1980, Ramaley 1916, Smoliak 1965, Smoliak et al. 1972, Soil Conservation Service 1978, Stearns-Roger Inc. 1978, Stoecker-Keammerer Consultants n.d.(a), Tolstead 1941, Trammell and Trammell 1977, Vestal 1914, Weaver and Albertson 1956

HESPEROSTIPA COMATA - BOUTELOUA GRACILIS - CAREX FILIFOLIA HERBACEOUS VEGETATION

Needle-and-Thread - Blue Grama - Threadleaf Sedge Herbaceous Vegetation
Needle-and-Thread - Blue Grama Mixedgrass Prairie

ELEMENT CONCEPT

Summary: This needlegrass - grama grass prairie community is common in the northern and central Great Plains of the United States. Stands occur on flat to rolling topography with deep (40-100 cm), sandy loam to loam, coarser-textured soils. They are typically associated with uplands, though they may also occur lower in the landscape, such as coulee and draw bottoms, if soils are sufficiently coarse (usually sandstone-derived). The type is found at elevations ranging from 600-1700 m (2000-5500 feet); average annual precipitation associated with these elevation param ranges from slightly less than 25 cm to over 50 cm (10-20 inches). The vegetation is dominated by moderate to moderately dense medium-tall grasses. *Hesperostipa comata (= Stipa comata)* is the tallest of the dominant species, sending seed heads to a maximum height of approximately 1 m. The rhizomatous graminoids *Bouteloua gracilis* and *Carex filifolia*, the other two dominant/codominant species, do not usually exceed 0.5 m. *Calamovilfa longifolia* is often found with high cover values on sandier soils, and *Koeleria macrantha* cover increases on degraded sites. There are regionalized expressions of variability with *Carex inops* ssp. *heliophila*

surpassing *Carex filifolia* in Colorado and *Calamagrostis montanensis* being at least as important as the diagnostic species in north-central Montana. *Pascopyrum smithii* is consistently present. For woody species, subshrub forms (*Artemisia frigida, Gutierrezia sarothrae, Rosa arkansana*) have the highest cover and constancy, but their total cover does not sum to more than 5%, except on overgrazed sites. Cover values for forbs are low (the exception being *Selaginella densa*). Geographic setting influences forb composition to some degree, with *Sphaeralcea coccinea, Phlox hoodii, Heterotheca villosa, Gaura coccinea,* and *Liatris punctata* common in the northern areas, and *Lygodesmia juncea, Opuntia polyacantha, Artemisia dracunculus,* and *Ratibida columnifera* seeming to increase to the eastern and southern areas.

Environment: Stands occur on flat to rolling topography with deep (40-100 cm) sandy loam to loam soils. They are typically associated with uplands, though they may also occur lower in the landscape, such as coulee and draw bottoms, if soils are sufficiently coarse (usually sandstone derived). Even though it is a major association in the Northern Plains, it does not occur in areas dominated exclusively by shale and mudstone parent materials, from which heavy soils are derived. This type is found at elevations ranging from 600 to 1700 m (2000-5500 feet); average annual precipitation associated with these elevation parameters ranges from slightly less than 25 cm to over 50 cm (10 to 20 inches).

Vegetation: The vegetation is dominated by moderately dense graminoids that are usually between 0.5 and 1 m tall. For example, on 19 stands in west-central Montana the cover by the different strata was as follows: shrubs 6%, graminoids 67%, forbs 11%, bryophytes 14%, litter 55%, rock 4%, bare soil 9% (Mueggler and Stewart 1978). Thilenius et al. (1995) found that the average cover on 14 stands in eastern Wyoming was 42%. *Hesperostipa comata (= Stipa comata)* is the tallest of the dominant species, sending seed heads to a maximum height of approximately 1 m. The rhizomatous graminoids *Bouteloua gracilis* and *Carex filifolia*, the other two dominant/codominant species, do not usually exceed 0.5 m. *Calamovilfa longifolia* is often found with high cover values on sandier soils and *Koeleria macrantha* cover increases on degraded sites. There are regionalized expressions of variability with *Carex inops* ssp. *heliophila* surpassing *Carex filifolia* in Colorado and *Calamagrostis montanensis* being at least as important as the diagnostic species in north-central Montana. *Pascopyrum smithii* is consistently present. For woody species, subshrub forms (*Artemisia frigida, Gutierrezia sarothrae, Rosa arkansana*) have the highest cover and constancy but their total cover does exceed more than 5%, except on overgrazed sites. Cover values for forbs are low throughout the range of the type (the exception being *Selaginella densa*). Geographic setting does influence forb composition to some degree. *Sphaeralcea coccinea, Phlox hoodii, Heterotheca villosa, Gaura coccinea*, and *Liatris punctata*, have high constancy values in northern areas, whereas in the eastern and southern portions of the range *Lygodesmia juncea, Opuntia polyacantha, Artemisia dracunculus* and *Ratibida columnifera* seems to be more constant.

Dynamics: Vast (singly and in the aggregate) prairie dog (*Cynomys ludovicianus*) "towns" once developed on the favorable substrates of this type and exploited its vegetation. Prairie dog populations have undergone a precipitous decline since settlement, so much of this type could be in various states of secondary succession, returning from a somewhat denuded state and altered composition created by the prairie dogs (and attendant bison that found nutritious forage here). Fire, both aboriginal- and lightening-caused, was a regular part of this landscape. Fire-return intervals have been considerably lengthened since settlement by European-Americans.

This association and *Pascopyrum smithii - Bouteloua gracilis - Carex filifolia* Herbaceous Vegetation (CEGL001579) could be considered the most common plant associations in the Northern Great Plains (Martin et al. 1998). These two associations, cited by many authors as the climatic climax communities for this region, are manifested by matrix or large patch occurrences frequently found dominating whole landscapes. The *Hesperostipa comata (= Stipa comata)* defined community is more associated with uplands and the *Pascopyrum smithii* defined type characterizes sites with higher moisture status, generally occurring at lower positions in the landscape.

Similar Associations:
- Pascopyrum smithii - Hesperostipa comata Central Mixedgrass Herbaceous Vegetation (CEGL002034)
- Bouteloua gracilis - Buchloe dactyloides Xeric Soil Herbaceous Vegetation (CEGL002270)--On degraded sites, or on intermediate habitats, this type can be confused with CEGL002037.

Synonymy:
- *Stipa comata - Carex filifolia* Habitat Type (Hansen et al. 1984) =
- Gramagrass - Needlegrass - Sedge (Hanson and Whitman 1938) =
- *Stipa-Boutleoua* (Hubbard 1950) =
- *Bouteloua-Stipa* (Hubbard 1950) =
- *Stipa comata / Bouteloua gracilis* Plant Association (Johnston 1987) B
- *Stipa comata / Carex filifolia* Plant Association (Johnston 1987) =
- Association *Rumicetum venosi, subassoc. Boutelouetsum* (Looman 1980) =
- Mixed prairie (Tolstead 1941) B

GRank & Reasons: G5 (99-02-25). This is an exceedingly common type, manifesting any number of permutations, some of which are related to disturbance and some of which appear to be related to the expected geographic distinctions in such a broadly distributed type. The only reason to consider it a G4 is that it has received, and continues to receive, significant grazing pressure which, combined with the surge in alien weed populations, pose a significant threat to its quality.
High-ranked species:
Comments: *Carex filifolia* is lacking or highly reduced in importance southward. Southern stands were once classified separately (CEGL001699), and further review of their characteristics compared to more northern stands is needed. Weaver and Albertson (1956) also remark on the fact that low sedges are present as far south as Texas but are important only north of Colorado. However, a phase of the *Stipa comata - Bouteloua gracilis* type of Mueggler and Stewart (1980) in western Montana is apparently quite similar to communities of the southern and southeastern portions or the Northern Great Plains, and both lack *Carex filifolia*. There are a welter of named community types, mostly seral representations of grazing or fire impacts, that vary by having one or another of the defining species (or even other graminoids, e.g., *Carex inops* ssp. *heliophila*) dominant. This assemblage of types is also defined by having relatively low cover of both *Pascopyrum smithii* and *Elymus lanceolatus (= Agropyron dasystachyum)*. To accommodate these permutations within the concept of the type (as lesser-ranked occurrences) or to recognize them as independent vegetation types recognized by existing vegetation composition is one question. Another is, what cover value or degree of dominance of *Pascopyrum smithii* or *Elymus lanceolatus* will serve to establish the distinction between *Pascopyrum smithii - Stipa comata - Carex filifolia* (and allied *Pascopyrum smithii*-"dominated" communities) from the community under consideration.

ELEMENT DISTRIBUTION

Range: This needlegrass - grama grass prairie community is common in the northern and central Great Plains of the United States and Canada, ranging from Manitoba west to Alberta, south to Kansas and possibly Colorado.
Nations: CA US
States/Provinces: AB:S?, CO?, KS:S?, MB:S3, MT:S?, ND:S3?, NE:S?, SD:S?, SK:S?, WY:S3
USFS Ecoregions: 251Ab:CCC, 251Ba:CCC, 331C:CC, 331E:C?, 331F:CC, 331G:CC, 331H:CC, 332C:CC, M334A:CC

ELEMENT SOURCES

Authors: J. Drake, MCS **Confidence:** 1 **Identifier:** CEGL002037
References: Hansen et al. 1984, Hanson and Whitman 1938, Hubbard 1950, Johnston 1987, Looman 1980, Mueggler and Stewart 1978, Mueggler and Stewart 1980, Steinauer and Rolfsmeier 2000, Thilenius et al. 1995, Tolstead 1941, Tolstead 1942, Weaver and Albertson 1956

V.A.5.N.c.27. PASCOPYRUM SMITHII HERBACEOUS ALLIANCE

Western Wheatgrass Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance is common and widespread in the Great Plains, especially the northern portions, and parts of the Great Basin. The communities in it range from dry or dry-mesic to wet-mesic. Mid grasses are the dominant vegetation in most communities, although short grasses and sedges can be codominant. The vegetation tends to be denser where the mid grasses are predominant and more open where shorter graminoids are abundant. The mid grasses grow to 0.5-1.0 m on favorable sites, while the short grasses and sedges are less than 0.5 m tall. The most abundant midgrass is *Pascopyrum smithii*. Common associates include *Hesperostipa comata (= Stipa comata), Nassella viridula, Koeleria macrantha, Schizachyrium scoparium, Hesperostipa spartea (= Stipa spartea),* and *Poa* spp. In the drier communities of this alliance *Bouteloua gracilis* is the most common shortgrass. Other short graminoids typically found in the drier communities include *Carex inops* ssp. *heliophila, Carex duriuscula (= Carex eleocharis), Carex filifolia,* and *Bouteloua curtipendula* (in the northern portion of this alliance's range), *Aristida purpurea,* and *Buchloe dactyloides* (in the southern half of this alliance's range). In the wetter communities within this alliance, *Distichlis spicata, Hordeum jubatum, Elymus trachycaulus,* and *Iva annua* are common. Forbs and shrubs are generally minor components of communities within this alliance. If shrubs are present they are rarely taller than 1 m. Some forbs that are usually scattered about are *Gaura coccinea, Sphaeralcea coccinea, Amorpha canescens, Astragalus* spp., and *Tragopogon dubius*. Shrubs include *Symphoricarpos occidentalis, Artemisia cana, Artemisia frigida,* and *Opuntia* spp.

Communities within this alliance occur on several different soil types. The soil is most often clay or clay loam, however. it can be loam or sandy loam. In the east and central part of this alliance's range, these communities can be found on flat or rolling uplands, hillslopes, or along streams or depressions. In the western part of this alliance's range, its communities are found where local conditions are wetter than the average. This includes such areas as the base of slopes or along rivers or streams.

Environment: Grasslands included in this alliance occur across the Great Plains, on several different soil types (Hanson and Whitman 1938, Johnston 1987, USFS 1992). The soil is most often clay or clay loam, however it can be loam or sandy loam. In the eastern and central part of this alliance's range, these communities can be found on flat or rolling uplands, hillslopes, or along streams or depressions. In the western part of this alliance's range, communities are found where local conditions are wetter than the average. This includes such areas as the base of slopes or along rivers or streams (Weaver and Albertson 1956, Jones 1992).

Vegetation: This alliance is common and widespread in the Great Plains, especially the northern portions, and parts of the Great Basin. These communities range from dry or dry-mesic to wet-mesic. Mid grasses are the dominant vegetation in most communities, although short grasses and sedges can be codominant. The vegetation tends to be denser where the mid grasses are predominant and more open where shorter graminoids are abundant (e.g., Hansen and Hoffman 1988, USFS 1992). The mid grasses grow to 0.5-1.0 m on favorable sites, while the short grasses and sedges are less than 0.5 m tall (Weaver and Albertson 1956). The most abundant midgrass is *Pascopyrum smithii*. Common associates include *Hesperostipa comata (= Stipa comata), Elymus trachycaulus, Nassella viridula, Koeleria macrantha, Schizachyrium scoparium, Hesperostipa spartea (= Stipa spartea),* and *Poa* spp. In the drier communities of this alliance *Bouteloua gracilis* is the most common shortgrass. Other short graminoids typically found in the drier communities include *Carex inops* ssp. *heliophila, Carex duriuscula (= Carex eleocharis), Carex filifolia*, and *Bouteloua curtipendula* (in the northern portion of this alliance's range), *Aristida purpurea* and *Buchloe dactyloides* (in the southern half of this alliance's range). In the wetter communities within this alliance *Distichlis spicata, Hordeum jubatum, Elymus trachycaulus,* and *Iva annua* are common. Forbs and shrubs are generally minor components of communities within this alliance. If shrubs are present they are rarely taller than 1 m. Some forbs that are usually scattered about are *Gaura coccinea, Sphaeralcea coccinea, Amorpha canescens, Astragalus* spp., and *Tragopogon dubius*. Shrubs include *Symphoricarpos occidentalis, Artemisia cana, Artemisia frigida,* and *Opuntia* spp.

Dynamics: *Pascopyrum smithii* is rhizomatous and is tolerant of moderate grazing. If severely over-grazed, *Pascopyrum smithii* will decline and may be replaced by less desirable warm season grasses and exotic species such as *Poa pratensis*.

ALLIANCE DISTRIBUTION

Range: Grasslands included in this alliance are found in the western Great Plains, from New Mexico north into Colorado, Wyoming and Montana, as well as Kansas north into Saskatchewan and Manitoba. It is also found in scattered locations in Idaho and Utah, and possibly Alberta, Canada.
Nations: CA US
States/Provinces: AB CO ID KS MB MT ND NE NM SD SK UT WY

USFS Ecoregions: 251Aa:CCC, 315A:CC, 331D:CC, 331E:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 332:C, 342F:CC, M313B:CC, M331A:CC, M331F:CC, M332D:C?, M332E:CC

ALLIANCE SOURCES

Authors: MCS, MOD. M.S. REID, MOD., MCS **Identifier:** A.1232

References: Baker 1983c, Baker and Kennedy 1985, Bear Creek Uranium Mine Application n.d., Boutton et al. 1980, Branson et al. 1961, Branson et al. 1964, Branson et al. 1965, Bujakiewicz 1975, Bunin 1985, Cacek 1973, Christensen and Welsh 1963, Costello 1944, Culwell and Scow 1982, DeVelice et al. 1991, Dick-Peddie 1986, Donart et al. 1978a, Faber-Langendoen et al. 1996, Hadley and Branson 1965, Hansen 1985, Hansen and Hoffman 1988, Hansen et al. 1984, Hansen et al. 1991, Hanson 1957, Hanson and Ball 1928, Hanson and Dahl 1956, Hanson and Whitman 1938, Hanson et al. 1931, Hyder et al. 1966, Johnston 1987, Jones 1992, Kahler 1973, Keammerer and Stoecker 1975, Marr and Buckner 1974, Moir 1969, Muldavin and Mehlhop 1992, Mutel 1976, Ramaley 1916, Ramaley 1919, Ramaley 1927, Ramaley 1942, Rogers 1950a, Shanks 1977, Shantz 1906, Shantz 1911, Shantz 1923, Soil Conservation Service 1978, Stoecker-Keammerer Consultants n.d.(b), U.S. Forest Service (USFS) 1992, Vestal 1913, Vestal 1914, Vestal 1919, Weaver and Albertson 1956, Western Resources Development Corporation n.d. (a), Wooten 1980.

PASCOPYRUM SMITHII HERBACEOUS VEGETATION

Western Wheatgrass Herbaceous Vegetation

Western Wheatgrass Mixedgrass Prairie

ELEMENT CONCEPT

Summary: This midgrass prairie type is found in the northern and western Great Plains, Rocky Mountains, and western basins of the United States and possibly Canada. Stands occur on level to gently sloping terrain. They are sometimes found on alluvial fans. The soils are clay, clay loam, and silt loam. The dominant mixedgrass species grow to approximately 1 m. *Pascopyrum smithii* may have as much as 50% coverage. Other grasses that co-occur and may achieve local dominance are *Koeleria macrantha* and *Poa* spp. Many other species common in midgrass prairies are also found in this community. These include *Artemisia ludoviciana, Bouteloua gracilis, Nassella viridula,* and *Hesperostipa comata (= Stipa comata)*. This community is similar to several others that have significant amounts of *Pascopyrum smithii*. Further work needs to be done to better define the diagnostic characteristics of this community.

Environment: This community occurs on flat to gently sloping topography. Soils are clay, clay loam, and silt loam. It is sometimes found on alluvial fans of small streams. The soils are deep (40-100 cm) and well-developed.

Vegetation: This is a midgrass community. Shrubs are rare. The dominant species grow to approximately 1 m. *Pascopyrum smithii* is the only constant dominant species and may have 50% cover. Other species such as *Koeleria macrantha* and *Poa* spp. may be locally abundant. Many other species common in midgrass prairies are also found in this community. These include *Artemisia ludoviciana, Bouteloua gracilis, Nassella viridula,* and *Hesperostipa comata (= Stipa comata)*.

Dynamics:

Similar Associations:

- Pascopyrum smithii - Nassella viridula Herbaceous Vegetation (CEGL001583)

Synonymy:

- Wheatgrass (Aldous and Shantz 1924) =
- *Agropyron smithii* Great Basin Grassland (Baker and Kennedy 1985) =

GRank & Reasons: G3G5Q (96-02-01).

High-ranked species:

Comments: This community is similar to several others that are dominated or codominated by *Pascopyrum smithii*. As currently defined, it represents a western Great Plains and foothills version of the western wheatgrass types in the central Great Plains. Further work needs to be done to refine the differences in composition and environmental characteristics. See recent descriptions by Thilenius et al. (1995, *Pascopyrum smithii* sodgrass steppe, a more playa-like wheatgrass type) and by Steinauer and Rolfsmeier (2000). In Nebraska, Steinauer and Rolfsmeier (2000) suggest that their stands may resemble *Pascopyrum smithii - Nassella viridula* Herbaceous Vegetation (CEGL001583).

ELEMENT DISTRIBUTION

Range: This midgrass prairie type is found in the northern and western Great Plains, Rocky Mountains and western basins of the United States and possibly Canada, ranging from North Dakota and possibly Saskatchewan, south to Nebraska and Colorado, west to Utah, and north to Idaho.
Nations: CA US
States/Provinces: CO:S1?, ID:S1Q, MT:S4, NE:S?, SD:S?, SK:S?, UT:S3S5, WY:S4Q
USFS Ecoregions: 331D:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 342F:CC, M331A:CC, M332E:CC

ELEMENT SOURCES

Authors: Drake, J. F., WCS **Confidence:** 3 **Identifier:** CEGL001577
References: Aldous and Shantz 1924, Baker 1983c, Baker and Kennedy 1985, Bunin 1985, Christensen and Welsh 1963, Godfread 1994, Hansen et al. 1991, Marr and Buckner 1974, Ramaley 1916, Ramaley 1919, Ramaley 1942, Shanks 1977, Soil Conservation Service 1978, Steinauer and Rolfsmeier 2000, Thilenius et al. 1995

V.A.5.N.j. Temporarily flooded temperate or subpolar grassland

V.A.5.N.j.22. HORDEUM JUBATUM TEMPORARILY FLOODED HERBACEOUS ALLIANCE

Foxtail Barley Temporarily Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance is found in the northern and western Great Plains and is dominated by short and medium-tall graminoids with a total vegetation cover of nearly 100%. Shrubs are often absent, and forbs are present but not usually abundant. *Hordeum jubatum* is the dominant species. Other common species include *Elymus trachycaulus, Distichlis spicata, Pascopyrum smithii, Poa arida, Poa compressa, Rumex crispus,* and *Sonchus arvensis*.

Stands are located in lowlands with moderately to strongly saline soils. The topography is flat and the soils are often briefly flooded or saturated in the spring.

Environment: Stands included in this alliance have been reported from lowlands across the northern Great Plains. The climate is semi-arid continental with mean annual precipitation of 25-48 cm. Elevation ranges from 750-1250 m. The topography is flat and the soils are often briefly flooded or saturated in the spring (Redmann 1972). It is also found in the drawdown zone of ponds with moderately saline water (Hansen et al. 1995). Soils are clay loam to clay and poor to very poorly drained. Soil salinity is somewhat variable. Wilson (1967) found *Hordeum jubatum* grew best in non-saline soils in laboratory conditions. In the field with competition, this grass grew best in moderately saline conditions (up to 0.7% salinity). The soil surface may be covered with white salt crusts with moderately to strongly saline soils (Barnes 1978, Wilson 1967, Ungar 1969, Hansen et al. 1995). Adjacent wetter sites are often open water, while surrounding uplands can be dominated by a variety of grasslands or shrublands.

Vegetation: Grasslands included in this alliance are found in lowland sites in the northern and western Great Plains. The vegetation is a sparse to dense layer of short and medium-tall graminoids dominated by the cool-season, short-lived, perennial bunchgrass *Hordeum jubatum*. It often occurs in nearly pure stands. Ungar (1969) described one stand that was dominated by *Hordeum jubatum* in the spring and early summer, then became dominated by *Iva annua* in the late summer. Total vegetation cover is usually high, but can range from 20% to nearly 100% (Barnes 1978, Hansen et al. 1995). Shrubs are often absent and forbs are present, but not usually abundant. Species diversity is typically low. Other species include *Chenopodium* spp., *Distichlis spicata, Eleocharis* spp., *Elymus trachycaulus, Iva annua, Pascopyrum smithii, Poa arida, Poa compressa, Puccinellia nuttalliana, Rumex crispus, Salicornia rubra,* and *Schoenoplectus maritimus (= Scirpus paludosus).*

Dynamics: *Hordeum jubatum* is a common, short-lived pioneer species of mesic prairie habitats where permanent grass cover has been destroyed (Dodd and Coupland 1966). It may represent a seral stage that will be taken over by more permanent grasses (Hansen et al. 1995). It is moderately salt-tolerant and can densely colonize areas disturbed by flooding along drainages, around playas and more permanent ponds. *Hordeum jubatum* is moderately tolerant of salinity. Often on playas, these grasslands occupy a zone of intermediate salinity between halophytic vegetation dominated by *Distichlis spicata, Puccinellia nuttalliana,* or *Salicornia rubra,* and non-saline, mesic prairie vegetation dominated by *Pascopyrum smithii, Poa* spp. or *Elymus* spp. Total vegetation cover (density and height), species composition and soil salinity depend on the amount and timing of precipitation and flooding. Growth-inhibiting salt concentrations are diluted when the soil is saturated, allowing the growth of less salt-tolerant species and more robust growth (Ungar 1967).

ALLIANCE DISTRIBUTION

Range: This alliance is found in the northern and western Great Plains. It ranges from Colorado to Montana and the Dakotas, then into southern Saskatchewan in Canada. It is likely that it occurs elsewhere in western North America, but is little reported in the literature.
Nations: CA US
States/Provinces: CO MT ND SD? SK
USFS Ecoregions: 251Aa:CCC, 331D:CC, 331E:CC, 331F:CC, 331G:CC, 332:?, M332C:CC, M332D:CC, M332E:CC

ALLIANCE SOURCES

Authors: K. SCHULZ, WCS **Identifier:** A.1358

References: Baker 1984a, Barnes and Tieszen 1978, Bunin 1985, Dodd and Coupland 1966, Faber-Langendoen et al. 1996, Hansen et al. 1988, Hansen et al. 1991, Hansen et al. 1995, Redmann 1972, Reid 1974, Ungar 1967, Ungar et al. 1969, Vestal 1914

HORDEUM JUBATUM HERBACEOUS VEGETATION
Foxtail Barley Herbaceous Vegetation
Foxtail Barley Meadow

ELEMENT CONCEPT

Summary: This foxtail barley community type is found in the northern and central Great Plains of the United States and Canada, in lowlands with moderately to strongly saline soils. The topography is flat and the soils are often flooded or saturated in the spring. The vegetation is dominated by short and medium tall graminoids with a total vegetation cover of nearly 100%. Shrubs are usually absent. *Hordeum jubatum* dominates the community. Other common species in this community are *Elymus trachycaulus, Distichlis spicata, Pascopyrum smithii, Poa arida, Poa compressa, Rumex crispus,* and *Sonchus arvensis.*

Environment: Stands are located in lowlands with moderately to strongly saline soils (Barnes 1978). The topography is flat and the soils are often flooded or saturated in the spring (Redmann 1972).

Vegetation: The vegetation is dominated by short and medium-tall graminoids with a total vegetation cover of nearly 100% (Barnes 1978). Shrubs are usually absent. *Hordeum jubatum* dominates the community. Other common species in this community are *Elymus trachycaulus, Distichlis spicata, Pascopyrum smithii, Poa arida, Poa compressa, Rumex crispus,* and *Sonchus arvensis.*

Dynamics:
Similar Associations:
- Distichlis spicata - Hordeum jubatum - Puccinellia nuttalliana - Suaeda calceoliformis Herbaceous Vegetation (CEGL002273)

Synonymy:
- *Hordeum* Type (Redmann 1972) =. uncertain if equivalent
- Foxtail Barley Community (Barnes and Tieszen 1978) =. uncertain if equivalent

GRank & Reasons: G4 (96-02-01).
High-ranked species:
Comments: This type is poorly defined. This abstract is based on two descriptions of *Hordeum jubatum*-dominated stands which are assumed to be examples of this community. These stands may be variants of *Distichlis spicata - Hordeum jubatum - Puccinellia nuttalliana - Suaeda calceoliformis* Herbaceous Vegetation (CEGL002273). The relationship between *Hordeum jubatum* Herbaceous Vegetation (CEGL001798) and that type is unclear. Both communities usually contain *Distichlis spicata* and *Hordeum jubatum* in varying amounts. The presence of *Puccinellia nuttalliana* or *Suaeda calceoliformis* may be distinguishing factors. They appear to be more characteristic of strongly saline areas while *Hordeum jubatum* can dominate on less saline sites (Redmann 1972). Classification problems may arise on intermediate sites when *Hordeum jubatum* is the dominant species and *Distichlis spicata, Puccinellia nuttalliana,* and *Suaeda calceoliformis* are present in minor amounts.

ELEMENT DISTRIBUTION

Range: This foxtail barley community type is found in the northern and central Great Plains of the United States and Canada, ranging from Colorado to Saskatchewan.
Nations: CA US
States/Provinces: CO:S3?, MT:S4, ND:S?, SD?, SK:S?
USFS Ecoregions: 251Aa:CCC, 331D:CC, 331E:CC, 331F:CC, 331G:CC, 332:?, M332C:CC, M332D:CC, M332E:CC

ELEMENT SOURCES

Authors: J. Drake, WCS **Confidence:** 3 **Identifier:** CEGL001798
References: Barnes and Tieszen 1978, Bunin 1985, Hansen et al. 1991, Redmann 1972, Reid 1974, Vestal 1914

V.A.5.N.k. Seasonally flooded temperate or subpolar grassland

V.A.5.N.k.58. CAREX PRAEGRACILIS SEASONALLY FLOODED HERBACEOUS ALLIANCE

Clustered Field Sedge Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: Vegetation types within this seasonally flooded, temperate or subpolar grassland alliance occur in wet meadows and moist swales and adjacent to seeps, springs, and stream channels in the mountains and shortgrass prairie. Elevations range from 1300-2400 m. Sites range from wet meadows that are often alkaline to peat-accumulating fens. The majority of the sites are relatively flat (1-4% slope). Soils are variable. Some sites have fairly deep soils that range from heavy clays to sandy clay loams with mottling. Sites near seeps or springs have peaty soils, up to 60 cm deep. Surface water is typically present for extended periods well into the growing season. The water table is usually near the soil surface. *Carex praegracilis* dominates the graminoid stratum with up to 100% cover. Stands on drier sites form narrow bands with 25-30% cover. Other graminoid species include *Calamagrostis stricta, Carex aquatilis, Carex simulata, Carex utriculata, Deschampsia caespitosa, Eleocharis palustris,* and *Juncus balticus*. The forb stratum is present with up to 30% cover; species include *Cicuta douglasii* and *Senecio hydrophilus*. Adjacent vegetation includes patches of *Carex nebrascensis* and *Pascopyrum smithii (= Agropyron smithii)* on the prairie and *Salix* spp. shrublands in the mountains.

Environment: Vegetation types within this alliance occur in wet meadows and moist swales and adjacent to seeps, springs, and stream channels in the mountains and shortgrass prairie. Elevations range from 1300-2400 m. Sites range from wet meadows that are often alkaline to peat-accumulating fens. The majority of the sites are relatively flat (1-4% slope).

Soils are variable. Some sites have fairly deep soils that range from heavy clays to sandy clay loams with mottling. Sites near seeps or springs have peaty soils, up to 60 cm deep. Surface water is typically present for extended periods well into the growing season. The water table is usually near the soil surface. Adjacent vegetation includes patches of *Carex nebrascensis* and *Pascopyrum smithii (= Agropyron smithii)* on the prairie and *Salix* spp. shrublands in the mountains.

Vegetation: Vegetation types within this alliance are classified as seasonally flooded temperate or subpolar grasslands. *Carex praegracilis* dominates the graminoid stratum with up to 100% cover. Stands on drier sites form narrow bands with 25-30% cover. (Kittel et al. 1999). Other graminoid species include *Calamagrostis stricta, Carex aquatilis, Carex simulata, Carex utriculata, Deschampsia caespitosa, Eleocharis palustris,* and *Juncus balticus*. The forb stratum is present with up to 30% cover; species include *Cicuta douglasii* and *Senecio hydrophilus*.

Dynamics:

ALLIANCE DISTRIBUTION

Range: This alliance is found in Montana, Wyoming, Colorado, and New Mexico. *Carex praegracilis* is widespread through the western United States and the Great Plains, and has a range from British Columbia to Manitoba, Canada, and northern Michigan and south to California, Texas, and Iowa (Hermann 1970, Cronquist et al. 1977). Stands of the alliance may occur in this larger area.
Nations: CA MX US
States/Provinces: CA? CO ID MT OR UT WA WY
USFS Ecoregions: 342C:CC, 342D:CC, M242C:CC, M331A:CC, M331D:CC, M331H:CC, M331I:CC, M333C:CC

ALLIANCE SOURCES

Authors: D. CULVER, WCS **Identifier:** A.1419
References: Brotherson and Barnes 1984, Cronquist et al. 1977, Culver and Sanderson 1997, Durkin et al. 1994, Hansen et al. 1988, Hermann 1970, Jones and Walford 1995, Kittel et al. 1997, Kittel et al. 1999

CAREX PRAEGRACILIS HERBACEOUS VEGETATION

Clustered Field Sedge Herbaceous Vegetation

ELEMENT CONCEPT

Summary: This plant association forms meadows in swales and along stream channels in the prairies of several western states (Montana, Idaho, Wyoming, Colorado) on both sides of the Continental Divide. In Montana it is found at elevations as low as 2000 feet. The association occurs along small, shallow streams, usually no more than 2-5 m (7-17 feet) wide, with little sinuosity, low gradient and little to no floodplain development. Soils are deep, ranging from heavy clays to sandy clay loams. Often the only vegetation type along small streams, it completely covers the ground in narrow bands following the streambed and dominated by *Carex praegracilis* (20-40% cover), *Eleocharis palustris*, and *Equisetum laevigatum*. Alternatively, it can occur in patches within a mosaic of monotypic stands of wet meadow graminoid species including *Juncus balticus, Carex nebrascensis, Carex pellita (= Carex lanuginosa),* and *Schoenoplectus pungens (= Scirpus pungens).* No shrubs or trees are present.

Environment:

Vegetation:

Dynamics:

Similar Associations:

- Carex praegracilis - Carex aquatilis Herbaceous Vegetation (CEGL001821)

Synonymy:

GRank & Reasons: G3G4 (01-02-05). This association is known from several western states, although few stands have been well-documented. Stands are small meadows in Colorado (1-20 acres), but it is known to form large meadows in southwestern Montana. Occurrences on federal lands are often in a degraded condition. The highest conditions exist on unprotected private lands. Soil compaction and compositional shifts from grazing and heavy recreational use are the greatest threats. The global rank was changed from G2 to G3G4 to reflect the wide distribution of the type as well as its apparent abundance in several states (Montana and Wyoming).

High-ranked species:

Comments: This association is known from several western states (MT, ID, WY, CO), although few stands have been well-documented. This type needs to be compared with *Carex praegracilis - Carex aquatilis* Herbaceous Vegetation (CEGL001821), as they are probably the same type.

ELEMENT DISTRIBUTION

Range: The plant association occurs in appropriate habitat across the Rocky Mountain and northern Great Basin states.
Nations: US
States/Provinces: CO:S2, ID:S2, MT:S3S4, WY:S3S4
USFS Ecoregions: M331A:C?, M331G:CC, M331H:CC, M331I:CC, M332D:C?, M332E:C?, M333C:CC

ELEMENT SOURCES

Authors: WCS **Confidence:** 2 **Identifier:** CEGL002660
References: Culver and Sanderson 1997, Hansen et al. 1995, Jones and Walford 1995, Kittel et al. 1997, Kittel et al. 1999

V.A.5.N.k.47. DESCHAMPSIA CAESPITOSA SEASONALLY FLOODED HERBACEOUS ALLIANCE

Tufted Hairgrass Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: Plant associations included in this alliance are circumboreal and are common in alpine, wet meadows and wetland margin habitats. Stands are found in moist, low-gradient valley bottoms and along streams throughout the mountainous areas of the western U.S. Typically, communities occur in areas of abundant snowfall where snowmelt saturates soils from late spring through early summer. Communities occur in the alpine tundra in snowmelt basins and around the edges of alpine wetlands. At lower elevations, the communities are typically wetlands, requiring wet or moist soils throughout most of the growing season. Soils are variable. Fine-textured soils retain soil moisture longer in areas of seasonal drought, and coarse substrates allow aeration in areas with perennial high water tables. This vegetation is characterized by a moderately dense to dense herbaceous layer dominated by the perennial bunchgrass *Deschampsia caespitosa*. Commonly associated graminoid species include *Carex nebrascensis, Carex microptera, Carex aquatilis, Juncus balticus, Phleum alpinum, Danthonia intermedia,* and *Agrostis scabra*. Common forbs include *Geum rossii, Ligusticum tenuifolium, Polygonum bistortoides,* and *Caltha leptosepala*. Diagnostic of this herbaceous alliance is the dominance or codominance of *Deschampsia caespitosa* and the presence of surface water for extended periods during the growing season.

Environment: Plant associations within this alliance are circumboreal and occur in moist, low-gradient valley bottoms throughout the mountainous areas of the western United States at elevations ranging from 800-3500 m. *Deschampsia caespitosa* associations require relatively cool, moist conditions. Typically, communities occur in areas of abundant snowfall where snowmelt saturates soils from late spring through early summer. The vegetation occurs at higher elevations in the southern part of its range and in dry interior locations. Communities occur in the alpine tundra in Utah and Colorado where stands grow in snowmelt basins and around the edges of alpine wetlands. At lower elevations, the communities are typically wetlands, requiring wet or moist soils through most of the growing season. Soils are diverse. In perennially wet soils, stands of this alliance occur on sand or gravel lenses which allow adequate aeration of roots. In sites with seasonal drought, the vegetation generally occurs on finer-textured soils which drain slowly and retain moisture.

Vegetation: Associations within the *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance (A.1408) are common alpine, wet meadow, or wetland margin types in mountain habitats of the west (Padgett et al. 1989). The vegetation is typified by a lush growth of *Deschampsia caespitosa*, a perennial bunchgrass which forms an open canopy of culms and nodding panicles. Commonly associated graminoid species include *Carex nebrascensis, Carex microptera, Carex aquatilis, Juncus balticus, Phleum alpinum, Danthonia intermedia*, and *Agrostis scabra* (Johnson and Simon 1987, Hess and Wasser 1982, Padgett et al. 1989). Common forbs include *Geum rossii, Ligusticum tenuifolium, Polygonum bistortoides,* and *Caltha leptosepala*. The vegetation often occurs adjacent to perennially saturated sedge wetlands dominated by *Carex utriculata, Carex aquatilis, Carex simulata,* and others. Associations of this alliance generally grade into drier meadows of forbs (*Senecio integerrimus, Achillea millefolium,* and others) and grasses (*Festuca, Muhlenbergia, Poa* spp.).

Dynamics: Associations within this alliance are adapted to moist and wet soils which are seasonally flooded by snowmelt and retain moisture throughout the growing season. However, stands usually occur on sites without permanent surface water. Stands appear to be tolerant of moderate intensity ground fires and late season livestock grazing (Kovalchik 1987).

ALLIANCE DISTRIBUTION

Range: This alliance is found in wet, cold-winter habitats throughout the western United States. Associations have been reported from Arizona, Colorado, Utah, Idaho, Montana, Washington, and Oregon. Associations likely occur in Wyoming, New Mexico, California and Nevada, as well as elsewhere in the range of the distribution of *Deschampsia cespitosa*. The alliance is typically a moderate- to high-elevation type in the western United States, but occurs at lower elevations in humid regions of the Pacific Northwest. This montane forest alliance occurs in California's central Coast Ranges, the Transverse and Peninsular ranges.
Nations: MX US
States/Provinces: AZ CA CO ID MT NV? OR UT WA WY
USFS Ecoregions: 261A:CC, 331A:CC, 331D:CC, 331E:C?, 331G:CC, 341D:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, M242A:C?, M242C:CC, M261C:CC, M261D:CC, M261E:CC, M262B:CC, M313A:CC, M331A:CC,

M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341:C

ALLIANCE SOURCES

Authors: D. SARR, WCS **Identifier:** A.1408
References: Bonham and Ward 1970, Briggs and MacMahon 1983, Buckner 1977, Cooper et al. 1995, Crowe and Clausnitzer 1997, Daubenmire and Daubenmire 1968, Franklin and Dyrness 1973, Hall 1971, Hall 1973, Hamann 1972, Hansen et al. 1988, Hansen et al. 1991, Hansen et al. 1995, Hess and Wasser 1982, Johnson 1961b, Johnson and Simon 1985, Johnson and Simon 1987, Kettler and McMullen 1996, Kovalchik 1987, Mutz and Queiroz 1983, Padgett et al. 1988b, Padgett et al. 1989, Richard et al. 1996, Sanderson and Kettler 1996, Soil Conservation Service 1978, Terwilliger et al. 1979, Tiedemann 1972, Tuhy and Jensen 1982, Walford et al. 1997, Youngblood et al. 1985a, Youngblood et al. 1985b

DESCHAMPSIA CAESPITOSA HERBACEOUS VEGETATION

Tufted Hairgrass Herbaceous Vegetation
Tufted Hairgrass Meadow

ELEMENT CONCEPT

Summary: Community description in preparation
Environment:
Vegetation:
Dynamics:
Similar Associations:
Synonymy:
GRank & Reasons: G4 (98-04-09).
High-ranked species:
Comments:

ELEMENT DISTRIBUTION

Range:
Nations: US
States/Provinces: AZ:S2?, CA:SR, CO:S4, ID:S3, MT:S4, NV?, OR:S2, UT:S3S4, WA:S?
USFS Ecoregions: 261A:CC, 331A:CC, 331D:CC, 331E:C?, 331G:CC, 341D:CC, 342B:CC, M242A:C?, M242C:CC, M261C:CC, M261D:CC, M261E:CC, M262B:CC, M313A:CC, M331A:CC, M331D:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341:C

ELEMENT SOURCES

Authors: WCS **Confidence:** 2 **Identifier:** CEGL001599
References: Bonham and Ward 1970, Briggs and MacMahon 1983, Crowe and Clausnitzer 1997, Daubenmire and Daubenmire 1968, Franklin and Dyrness 1973, Hall 1971, Hall 1973, Hamann 1972, Hansen et al. 1988, Hansen et al. 1991, Hansen et al. 1995, Hess and Wasser 1982, Johnson and Simon 1985, Johnson and Simon 1987, Kettler and McMullen 1996, Kovalchik 1987, Mutz and Queiroz 1983, Padgett et al. 1988b, Padgett et al. 1989, Richard et al. 1996, Sanderson and Kettler 1996, Tiedemann 1972, Tuhy and Jensen 1982, Youngblood et al. 1985a, Youngblood et al. 1985b

V.A.5.N.k.61. ELEOCHARIS PALUSTRIS SEASONALLY FLOODED HERBACEOUS ALLIANCE

Marsh Spikesedge Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This herbaceous wetland alliance occurs in shallow, mostly still water throughout the much of the western United States and central Great Plains, from sea level to alpine. Stands occur on a variety of landforms including lake margins, stream terraces, floodplains, gravel bars, and wet basins (cienegas). Sites are flat to gently sloping on any aspect. Soils and parent materials are variable, but often highly organic and derived from alluvium. Surface water is typically present for an extended period during the growing season, and the high water table remains high most of the year. The vegetation is characterized by a sparse to dense herbaceous layer that is dominated or codominated by *Eleocharis palustris*, a facultative wetland species. Because of the variety of habitats where this alliance occurs, associated species are diverse. Characteristic associates include several species of *Carex, Juncus*, and *Scirpus*, most notably *Carex praegracilis* and *Juncus balticus*. Other important graminoids are *Phalaris arundinacea (= Phalaroides arundinacea), Spartina pectinata, Panicum virgatum, Deschampsia caespitosa, Distichlis spicata*, and *Muhlenbergia asperifolia*. Forb cover is also variable, and may include *Sparganium angustifolium, Lemna* spp., *Potamogeton* spp., *Berula erecta, Rorippa nasturtium-aquaticum, Pedicularis groenlandica, Rhodiola integrifolia, Caltha leptosepala, Mentha arvensis, Rumex crispus, Iris missouriensis*, and *Ranunculus cymbalaria*. Diagnostic of this herbaceous wetland alliance is the dominance or codominance of *Eleocharis palustris* and the presence of surface water for extended periods during the growing season.

Environment: Plant associations included in this alliance are conspicuous, common emergent associations that occur in shallow, mostly still water throughout the western United States. Elevation ranges from sea level in California to 3050 m in Colorado. Stands occur on a variety of landforms including lake margins, stream terraces, floodplains, gravel bars, and wet basins (cienegas). Stands occur on sites that are flat, 1% slope with all aspects (Crowe and Clausnitzer 1997). Soils vary from Histosols to Entisols. High-elevation stands consistently occur on organic (highly sapric) soils, or on a thick organic horizon that overlays fine to coarse alluvial material. Lower elevation stands occur on fresh alluvial deposits of fine-textured loamy sands, clays, and sandy clays (Kittel et al. 1999). Soil reaction is often alkaline (Hansen et al. 1988). All sites are saturated throughout much of the growing season. Oregon stands are located on soils derived from volcanic (andesite, basalt) or sedimentary parent materials (Crowe and Clausnitzer 1997).

At higher elevation, *Carex aquatilis* or *Carex utriculata* meadows and *Salix wolfii* or *Salix planifolia* shrublands occur within the riparian mosaic. At lower elevation, *Schoenoplectus pungens (= Scirpus pungens)* often occurs within the stream channel while wet meadow prairies of *Panicum virgatum* and *Sorghastrum nutans* occupy the immediate streambanks and low floodplains.

Vegetation: Plant associations within this alliance are classified as seasonally flooded, temperate or subpolar grasslands. *Eleocharis palustris*, a facultative wetland species, dominates the graminoid stratum. Cover ranges from sparse to quite dense (10-80%). *Eleocharis palustris* plant associations occur within a wide elevational range, and the species composition can be quite variable. In the Great Plains stands, co-occurring species often include *Phalaris arundinacea (= Phalaroides arundinacea), Juncus balticus, Carex praegracilis, Schoenoplectus pungens (= Scirpus pungens), Panicum virgatum, Carex pellita (= Carex lanuginosa), Spartina pectinata*, and *Schoenoplectus americanus (= Scirpus americanus)*. Forb cover can also include *Sparganium angustifolium, Lemna* spp., and *Potamogeton* spp. (Kittel et al. 1999). *Distichlis spicata* and *Muhlenbergia asperifolia* codominate the graminoid layer in the cienegas (Arizona and New Mexico). Forb cover is composed of *Berula erecta* and *Rorippa nasturtium-aquaticum*, especially in stands with deep water (Cross 1991).

At higher, montane elevations other graminoids present include *Carex aquatilis, Carex utriculata, Carex buxbaumii, Eleocharis rostellata*, and *Deschampsia caespitosa*. Forb cover is typically low, but can be up to 25% in some stands. Common forb species include *Pedicularis groenlandica, Rhodiola integrifolia*, and *Caltha leptosepala* (Hansen et al. 1995, Kittel et al. 1999).

Crowe and Clausnitzer (1997) state that *Eleocharis palustris* is an aggressive species, typically excluding other species from establishing. In the Oregon stands, associated forbs include *Mentha arvensis, Rumex crispus, Iris missouriensis*, and *Ranunculus cymbalaria*.

Dynamics: At lower elevations *Eleocharis palustris* plant associations occur well within the active channel and are inundated annually. These early seral communities colonize backwater eddies and shallow edges of slow moving reaches of small and larger rivers. The stands are probably ephemeral, as the eddies and river edges are scoured out each year during

high spring flows (Kittel et al. 1999). These communities have also been described as early seral stages by Padgett et al. (1989). Padgett et al. (1989) describe light colored soils for the sites, indicating an early phase of soil development. Kovalchik (1987) reports that the lower elevation plant associations within this alliance frequently form seral communities in ponded sites between stream rehabilitation structures such as loose rock check dams.

In the montane zone, associations within this alliance occur in ponded sites on faster moving streams. If siltation occurs, sites may become dominated by *Carex utriculata*. At higher elevations, the associations appear to be stable. Stands occur near seeps on soils with deep organic layers, often sapric, and are saturated throughout the growing season.

Crowe and Clausnitzer (1997) state that *Eleocharis palustris* is of little to no forage value to livestock and wild ungulates. On seasonally drier sites, ungulate trampling may cause this species to increase (Snyder 1992 as cited in Crowe and Clausnitzer 1997). However, this species does provide seed forage and cover to ducks and geese (Kovalchik 1987).

ALLIANCE DISTRIBUTION

Range: This alliance occurs from Oregon to Montana, south to California, Arizona, and New Mexico. The alliance is expected to occur in eastern Washington.
Nations: CA MX US
States/Provinces: AZ CA? CO ID MT MXSO NE NM NV OR SD SK UT WA WY
USFS Ecoregions: 321A:CC, 331D:CC, 331F:CC, 331G:CC, 341A:CC, 341B:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342G:CC, 342I:C?, M242C:CC, M261G:CC, M331A:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341B:CC

ALLIANCE SOURCES

Authors: D. CULVER, WCS **Identifier:** A.1422
References: Baker 1983c, Baker and Kennedy 1985, Brotherson 1987, Brotherson and Barnes 1984, Brown 1982, Bunin 1985, Cronquist et al. 1977, Cross 1991, Crowe and Clausnitzer 1997, Durkin et al. 1995, Ellis et al. 1979, Flowers 1962, Hansen et al. 1988, Hansen et al. 1991, Hansen et al. 1995, Hendrickson and Minckley 1984, Johnston 1987, Kartesz 1994, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1999, Kovalchik 1987, Kovalchik 1993, Manning and Padgett 1995, Mutel 1973, Mutel and Marr 1973, Padgett et al. 1988b, Padgett et al. 1989, Ramaley 1919a, Ramaley 1942, Reid et al. 1994, Sawyer and Keeler-Wolf 1995, Shupe et al. 1986, Stearns-Roger Inc. 1978, Stewart 1940, Sturges 1968, Youngblood et al. 1985a.

ELEOCHARIS PALUSTRIS HERBACEOUS VEGETATION

Marsh Spikerush Herbaceous Vegetation
Creeping Spikerush Wet Meadow

ELEMENT CONCEPT

Summary: This spikerush wet meadow community is found in the central Great Plains of the United States and Canada and in the western United States. Stands occur in small depressions in intermittent stream beds or depression pond that flood early in the season and dry out by summer. Stands are dominated by submersed and emergent rooted vegetation under 1 m tall. In northwestern Nebraska, *Eleocharis acicularis* and *Eleocharis palustris* commonly cover the bottoms of the pools and emerge above the water as the pools dry out. Ephemeral submersed aquatics, such as *Callitriche palustris (= Callitriche verna), Potamogeton diversifolius* and *Marsilea vestita*, may be present. As the pools dry out in mid summer, ephemeral annual forbs, such as *Limosella aquatica* and *Plagiobothrys scouleri*, may appear. By late summer *Amaranthus californicus* and *Gnaphalium palustre* may dominate in the lowest parts of the depression. In southwestern South Dakota, vegetation is composed of nearly homogeneous stands of *Eleocharis palustris*. Other emergents, such as *Polygonum amphibium, Marsilea vestita*, and *Eleocharis ovata* are occasionally found. Herbaceous cover is greater than 75%, except in areas of deeper open water where floating and submerged aquatic plants, including *Bacopa rotundifolia* and *Heteranthera limosa*, occur.

Environment: In northwest Nebraska and southwest South Dakota, this community occurs in small depressions in intermittent stream beds and depression ponds that flood early in the season and dry out by summer. Soils are silty clay formed from weathered siltstone and shale (Steinauer and Rolfsmeier 2000). In southwestern South Dakota, the type occupies depression ponds in prairies (H. Marriott pers. comm. 1999).

Vegetation: In northwestern Nebraska, stands are dominated by submersed and emergent rooted vegetation under 1 m tall. *Eleocharis acicularis* and *Eleocharis palustris* commonly cover the bottoms of the pools and emerge above the water as the pools dry out. Ephemeral submersed aquatics, such as *Callitriche palustris (= Callitriche verna), Potamogeton diversifolius* and *Marsilea vestita*, may be present. As the pools dry out in mid-summer, ephemeral annual forbs, such as *Limosella aquatica* and *Plagiobothrys scouleri*, may appear. By late summer *Amaranthus californicus* and *Gnaphalium palustre* may dominate in the lowest parts of the depression (Steinauer and Rolfsmeier 2000). In southwestern South Dakota, vegetation is composed of nearly homogeneous stands of *Eleocharis palustris*. Other emergents, such as *Polygonum amphibium, Marsilea vestita*, and *Eleocharis ovata* are occasionally found. Herbaceous cover is greater than 75% except in areas of deeper open water where floating and submerged aquatic plants, including *Bacopa rotundifolia* and *Heteranthera limosa*, occur (H. Marriott pers. comm. 1999).
Dynamics:
Similar Associations:
Synonymy:
GRank & Reasons: G5 (96-02-01).
High-ranked species:
Comments:

ELEMENT DISTRIBUTION

Range: This spikerush wet meadow community is found in the central Great Plains of the United States and Canada, and in the western United States, ranging from South Dakota northwestward to Montana and Saskatchewan, west to Washington, south to possibly California and east to Nevada.
Nations: CA US
States/Provinces: CA?, CO:S4, ID:S3, MT:S5, NE:S?, NV:SR, OR:S5, SD:S?, SK:S?, UT:S3?, WA:S?, WY:S3
USFS Ecoregions: 331D:CC, 331F:CC, 331G:CC, 341B:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342G:CC, 342I:C?, M242C:CC, M261G:CC, M331A:CC, M331D:CC, M331E:CC, M331G:CC, M331H:CC, M331I:CC, M332A:CC, M332B:CC, M332C:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:CC, M341B:CC

ELEMENT SOURCES

Authors: D. Faber-Langendoen, WCS **Confidence:** 1 **Identifier:** CEGL001833
References: Baker 1983c, Baker and Kennedy 1985, Brotherson and Barnes 1984, Bunin 1985, Ellis et al. 1979, Flowers 1962, Hansen et al. 1988, Hansen et al. 1991, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel et al. 1994, Kovalchik 1987, Kovalchik 1993, Mutel 1973, Mutel and Marr 1973, Padgett et al. 1988b, Padgett et al. 1989, Ramaley 1919a, Ramaley 1942, Stearns-Roger Inc. 1978, Steinauer and Rolfsmeier 2000, Stewart 1940, Youngblood et al. 1985a

V.A.5.N.k.49. POA SECUNDA SEASONALLY FLOODED HERBACEOUS ALLIANCE

Curly Bluegrass Seasonally Flooded Herbaceous Alliance

ALLIANCE CONCEPT

Summary: Stands included in this seasonally flooded grassland alliance are found in eastern Oregon's Columbia Basin and northwestern Nevada. The elevational range is from 1900-2400 m. Stands are found in flat, poorly drained floodplains and internally drained basins or historic lake basins (playas). Soils are moderately deep to deep, alkaline loams or clay loams. They are typically flooded in the spring and have a shallow water table that may drop below 1 m by the early summer. Upper soil horizons may be well-drained. Parent material is alluvium that may be derived from volcanic ash, rhyolite or basalt. Stands have moderately dense cover of perennial bunch grasses that are typically less than 0.5 m tall, but may extend up to 1 m. *Poa secunda* dominates or codominates the stands with *Puccinellia lemmonii* or *Elymus elymoides*. Other consistent graminoids may include *Carex microptera, Hordeum brachyantherum, Muhlenbergia richardsonis, Juncus balticus, Juncus ensifolius,* and *Pseudoroegneria spicata*. Forbs commonly found include the perennials *Achillea millefolium, Arnica longifolia, Iris missouriensis, Stellaria longipes*, and the annuals *Montia linearis* and *Trifolium cyathiferum*. The deciduous, succulent-leaved shrub *Sarcobatus vermiculatus* may occasionally occur in some stands and is typically 1-3 m tall. Estimates of plant species cover were not available. Adjacent vegetation may include fresh or saline wetlands dominated by species of *Carex* or *Juncus*. Uplands are typically shrublands dominated by *Artemisia tridentata* ssp. *vaseyana*.

Environment: Stands included in this seasonally flooded grassland alliance are found in eastern Oregon and northwestern Nevada. Elevations ranges from 1900-2400 m. The climate is temperate and semi-arid. Mean annual precipitation varies from 20-40 cm in the steppes, but may be over 60 cm at higher elevations in the Blue Mountains. A high proportion of the annual precipitation falls as snow. Summer is typically dry but may have occasional thunderstorms. Stands are found in flat, poorly drained floodplains and internally drained basins or historic lake basins (playas). Soils are moderately deep to deep, alkaline loams or clay loams. They are typically flooded in the spring and have a shallow water table that may drop below 1 m by the early summer. Upper soil horizons may be well-drained. Parent material is alluvium that may be derived from volcanic ash, rhyolite or basalt.

Adjacent vegetation may include fresh or saline wetlands dominated by species of *Carex* or *Juncus*. Uplands are typically shrublands dominated by *Artemisia tridentata* ssp. *vaseyana*.

Vegetation: This alliance includes grasslands that occur in floodplains of the Columbia Basin. Stands have moderately dense cover of perennial bunch grasses that are typically less than 0.5 m tall, but may extend up to 1 m. *Poa secunda* dominates or codominates the stands with *Puccinellia lemmonii* or *Elymus elymoides*. Other consistent graminoids may include *Carex microptera, Hordeum brachyantherum, Muhlenbergia richardsonis, Juncus balticus, Juncus ensifolius,* and *Pseudoroegneria spicata*. Common forbs include the perennials *Achillea millefolium, Arnica longifolia, Iris missouriensis, Stellaria longipes* and the annuals *Montia linearis* and *Trifolium cyathiferum*. The deciduous, succulent-leaved shrub *Sarcobatus vermiculatus* may occasionally occur in some stands and is typically 1-3 m tall. Estimates of plant species cover were not available.

Dynamics: These relatively mesic grasslands are transitional between wetlands and upland vegetation communities. They are dependent on spring flooding or shallow water table for supplemental moisture in the semi-arid region where they occur, but tolerate drying of the upper soil horizons when the water table drops below 1 m in early summer (Manning 1988). Blackburn et al. (1969) described *Carex* sp. / *Taraxacum officinale* Community in a meadow that is disturbed by haying and likely grazing. His report is probably a seral representative of a *Poa secunda / Carex* sp. habitat type. Total vegetation cover is 55%. Dominant species are *Elymus trachycaulus, Carex* sp., *Iris missouriensis,* and *Taraxacum officinale*.

ALLIANCE DISTRIBUTION

Range: Grasslands in this alliance occurs in floodplains in the Columbia Basin in Oregon and Nevada. It likely occurs in California, but necessary classification is needs to be done.
Nations: US
States/Provinces: CA? NV OR
USFS Ecoregions: 341:C, 342B:CC, 342C:C?, M242C:CC, M261G:CC

ALLIANCE SOURCES

Authors: K. SCHULZ, WCS **Identifier:** A.1410
References: Blackburn et al. 1969, Borgais 1990, Kagan 1986, Manning 1988, Reid et al. 1994, Sawyer and Keeler-Wolf 1995

POA SECUNDA HERBACEOUS VEGETATION
Curly Bluegrass Herbaceous Vegetation

ELEMENT CONCEPT

Summary: Community description in preparation
Environment:
Vegetation:
Dynamics:
Similar Associations:
Synonymy:
GRank & Reasons: G4? (96-02-01).
High-ranked species:
Comments:

ELEMENT DISTRIBUTION

Range:
Nations: US
States/Provinces: CA?, NV:S4, OR:S2
USFS Ecoregions: 341:C, 342B:CC, 342C:C?, M242C:CC

ELEMENT SOURCES

Authors: WCS **Confidence:** 2 **Identifier:** CEGL001657
References: Blackburn et al. 1969b, Manning 1988

V.A.7.N.e. Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer

V.A.7.N.e.11. ARTEMISIA CANA SHRUB HERBACEOUS ALLIANCE

Silver Sagebrush Shrub Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance is reported from the eastern Oregon mountain ranges and basins to southwestern Montana and the northern Great Plains. Stands are found in two different environmental settings, most commonly along non-active (higher) river and stream terraces and in upland areas with sandy soils. This vegetation has a sparse shrub layer (<25%) composed primarily of the characteristic shrub*Artemisia cana*, but *Artemisia tridentata* (usually ssp. *vaseyana* but occasionally ssp. *tridentata*), and *Chrysothamnus viscidiflorus* are common in some stands, as are *Symphoricarpos occidentalis* and *Artemisia frigida*. The herbaceous layer is dominated by graminoids and has more cover than the shrub layer. Dominant or important graminoids include *Poa fendleriana, Calamovilfa longifolia, Hesperostipa comata (= Stipa comata), Achnatherum hymenoides (= Oryzopsis hymenoides), Pascopyrum smithii, Festuca idahoensis, Carex inops* ssp. *heliophila, Muhlenbergia cuspidata, Nassella viridula (= Stipa viridula),* and *Bouteloua gracilis*. Among the typically sparse forbs that may be found are *Achillea millefolium, Gaura coccinea, Sphaeralcea coccinea, Lactuca tatarica* var. *pulchella, Symphyotrichum campestre* var. *bloomeri (= Aster campestris* var. *bloomeri), Cirsium foliosum*, and *Taraxacum officinale*. The vegetation in the alliance includes non-wetland plant associations dominated by *Artemisia cana* with less than 25% total shrub cover and an abundant herbaceous cover of medium stature.

Environment: Plant associations in this alliance occur in the northwestern Great Plains, southwestern Montana and in eastern Oregon. Elevations where it is found in the Great Plains range from 500-1000 m, in Oregon from 1060-2200 m, and in Montana over 1825 m. Precipitation varies across the range, from less than 25 cm in semi-arid basins of southeastern Oregon, to over 90 cm in moist meadow habitats of the northern Rocky Mountains. There are two environmental settings where the associations occur. One setting is along non-active (higher) terraces of rivers and streams; the other is in upland areas on sandy soils. Most commonly, the alliance occurs as an upper terrace community along mountain streams, where soils are saturated in spring and water tables remain within 2-3 m of the soil surface all year. Topography is usually mild, soils are fine to somewhat coarse alluvial soils, and some source of subsurface moisture is often present. In Oregon, soils are deep, easily eroded alluvium with surface textures of fine sandy to silty clay loams. Available water-holding capacity is moderately high. Water tables are within 2 feet of the soil surface in May and June, dropping to 4-5.5 feet below the soil surface in July through September. In Montana, some stands occur on well-drained, often sandy, glacial drift and sandy alluvium (Comer et al. 1999). Where herbaceous growth is vigorous and decomposition rates are low due to a high water table, soils may develop organic profiles. Adjacent vegetation varies from *Pinus contorta* forests in the mountains, to *Artemisia tridentata* shrublands or *Pseudoroegneria - Bouteloua* mixed grasslands in semi-arid basins and plains. In riparian zones, adjacent vegetation may be dominated by *Sarcobatus vermiculatus, Salix* spp. shrublands and *Carex* spp. meadows.

Vegetation: Vegetation types in this alliance are reported from eastern Oregon mountain ranges and basins, and the northern Great Plains. *Artemisia cana* is the dominant shrub, forming a sparse shrub layer from 0.4-1 m in height. The variation in height is related to which subspecies of *Artemisia cana* is present in the stands. In Oregon examples of this alliance, *Artemisia cana* is often the only shrub, but *Artemisia tridentata* (usually ssp. *vaseyana* but occasionally ssp. *tridentata*), and *Chrysothamnus viscidiflorus* can also be common in some stands. The bunchgrass *Poa fendleriana* is usually the dominant herbaceous species. Other common bunch grasses include *Koeleria macrantha, Elymus trachycaulus, Muhlenbergia richardsonis*, and *Carex praegracilis*. Forbs include *Achillea millefolium, Symphyotrichum campestre* var. *bloomeri (= Aster campestris* var. *bloomeri),* and *Cirsium foliosum*.

Examples of this alliance in the northern Great Plains and southwestern Montana generally occur in a moister climate, at least during the growing season. In addition to *Artemisia cana*, other common shrubs include *Artemisia tridentata* ssp. *vaseyana, Symphoricarpos occidentalis,* and *Artemisia frigida*. Herbaceous cover is moderate, but typically exceeds the shrub cover. Bunch grasses are the dominant life forms in this layer. Any one of the following species can be dominant or important: *Calamovilfa longifolia, Hesperostipa comata (= Stipa comata), Achnatherum hymenoides (= Oryzopsis hymenoides), Pascopyrum smithii, Festuca idahoensis, Carex inops* ssp. *heliophila, Muhlenbergia cuspidata, Nassella viridula (= Stipa viridula),* and *Bouteloua gracilis.* Among the forbs that are typically found are *Achillea millefolium, Gaura coccinea, Sphaeralcea coccinea, Lactuca tatarica* var. *pulchella*, and *Taraxacum officinale*.

Dynamics: The vegetation in this alliance usually occurs on alluvial terrain which is often grazed by domestic livestock and is strongly preferred during the growing season. Prolonged livestock use can decrease the abundance of native bunch grasses and increase the cover of shrubs and non-native grass species, such as *Poa pratensis* and *Taraxacum officinale*. Unlike other

Artemisia spp., *Artemisia cana* resprouts vigorously following spring fire, and prescribed burning may increase shrub cover. Conversely, fire in the fall may decrease shrub abundance.

ALLIANCE DISTRIBUTION

Range: Associations in this alliance are found in eastern Oregon, southwestern Montana, and in the northern Great Plains of Montana, Wyoming, and Alberta, Canada. The alliance is expected to occur in North Dakota and Saskatchewan, Canada.
Nations: CA US
States/Provinces: AB CA? MT ND NV? OR SD SK? WY
USFS Ecoregions: 331D:CC, 331F:CC, 331G:CC, 342A:CC, 342B:CC, 342C:CC, 342E:CC, 342F:CC, 342G:CC, M242C:CC, M261G:CC, M331A:CC, M331B:CC, M331D:CC, M332D:CC, M332E:CC

ALLIANCE SOURCES

Authors: D. SARR, WCS **Identifier:** A.1531
References: Chappell et al. 1997, Comer et al. 1999, Culwell and Scow 1982, DeVelice et al. 1991, Dealy 1971, Hansen and Hoffman 1988, Hansen et al. 1984, Hanson and Whitman 1938, Kovalchik 1987, Mueggler and Stewart 1980, Oregon Natural Heritage Program (ORNHP) n.d., Padgett 1982, Thilenius and Brown 1990, Thilenius et al. 1995, Warren n.d., Winward 1980

ARTEMISIA CANA / HESPEROSTIPA COMATA SHRUB HERBACEOUS VEGETATION

Silver Sagebrush / Needle-and-Thread Shrub Herbaceous Vegetation
Silver Sagebrush / Needle-and-Thread Shrub Prairie

ELEMENT CONCEPT

Summary: This shrub prairie association, which generally occurs in small patches (less than 1 hectare), occurs in the northwestern Great Plains. In Montana, it is found on benches to gently inclined slopes (30% maximum recorded) in the vicinity of breaklands. Similar habitats (old river terraces, badlands, ravine sideslopes and valley walls) support its occurrence in Alberta. Sites occur on various parent materials, but mostly well-drained, often sandy, glacial drift and sandy alluvium. *Artemisia cana* is decidedly the dominant shrub with canopy coverages to 50%, but averaging around 25%, which places it on the cusp of being a true shrub type. *Artemisia frigida* is the only shrub/subshrub with greater than 50% constancy and its cover does not exceed 3%. A number of graminoids have high constancy, including *Bouteloua gracilis, Carex filifolia, Koeleria macrantha*, and *Poa secunda (= Poa sandbergii)*, but only *Hesperostipa comata (= Stipa comata)* exhibits both 100% constancy and the highest cover values (averaging 38%). Forbs constitute an insignificant component, virtually none occurring in greater than trace amounts. Those exceeding 50% constancy are *Sphaeralcea coccinea, Pediomelum argophyllum (= Psoralea argophylla)*, and *Gaura coccinea*. This association is hypothesized to represent the driest environment capable of supporting *Artemisia cana*. Occasional fire probably has reduced *Artemisia* spp. cover and density to low levels and maintains the shrub herbaceous community structure.

Environment: This type is found on benches to gently inclined slopes (30% maximum recorded value) of rolling prairie, steeper ravine slopes, and all manner of topography in the vicinity of breaklands. It occurs on various parent materials but mostly well-drained, often sandy, glacial drift. The ground cover is highly variable with some sites (putatively overgrazed) having a sward of *Selaginella densa* and lichens, while others have 70% litter and trace amounts of *Selaginella densa*; only one plot had as much as 10% exposed soil, gravel and rock (combined cover).

Vegetation: *Artemisia cana* (probably *Artemisia cana* ssp. *cana* (Shultz 1984)) is decidedly the dominant shrub with canopy coverages ranging to 50% on heavily grazed sites, but averaging 27%; *Artemisia frigida* is the only shrub/subshrub with greater than 50% constancy and its cover did not exceed 3%. A number of graminoids have high constancy, including *Bouteloua gracilis, Carex filifolia, Koeleria macrantha*, and *Poa secunda (= Poa sandbergii)*, but only *Hesperostipa comata (= Stipa comata)* exhibits both 100% constancy and the highest cover values (averaging 38%). *Muhlenbergia cuspidata* and *Calamovilfa longifolia* had rather high cover on some sites. Forbs constitute an insignificant component, occurring in trace amounts; those exceeding 50% constancy are *Sphaeralcea coccinea, Pediomelum argophyllum (= Psoralea argophylla)* and *Gaura coccinea*. This association is hypothesized to represent the driest environment capable of supporting *Artemisia cana*; most often this association grades to upland range sites dominated by *Hesperostipa comata (= Stipa comata)* and *Bouteloua gracilis* and to the *Artemisia cana / Pascopyrum smithii* association that occupies more mesic positions on lower floodplain terraces.

Dynamics: The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. During presettlement time, when fires were more frequent, this type might not have attained these shrub densities.

Similar Associations:

- Artemisia cana ssp. cana / Calamovilfa longifolia Shrub Herbaceous Vegetation (CEGL001555)
- Artemisia cana ssp. cana / Pascopyrum smithii Shrub Herbaceous Vegetation (CEGL001556)

Synonymy:

- *Artemisia cana* - *Stipa comata* community type (DeVelice et al. 1995) =
- Spear Grass - Sagebrush Association (DeVelice et al. 1995) =
- Sagebrush / Needle & Thread Site Type (DeVelice et al. 1995) F
- Sagebrush flats (DeVelice et al. 1995) B
- *Artemisia cana / Bouteloua gracilis* - *Calamovilfa longifolia* (Thilenius et al. 1995) B
- *Artemisia cana* ssp. *cana / Calamovilfa longifolia* association (Thilenius et al. 1995) B

GRank & Reasons: G3 (99-12-06). This small patch type currently has a narrowly circumscribed geographic distribution, though it may be expected to occur in Saskatchewan and North Dakota. Habitats with the potential to support this type appear to be relatively abundant, but the type itself is comparatively uncommon. Though embedded in primarily agricultural landscapes, the proximity of this type to breaklands/badlands probably lessens the chances of its being sacrificed to the plow. This type's affinity for well drained benches and gently inclined landforms in a primarily agricultural landscape puts it at a moderate risk for agriculture conversion. Fortunately this landform also occurs in breakland and badland environments less desirable for agriculture, thus lessening the chances of this uncommon type being converted to agriculture. Its graminoid composition renders it only moderately attractive to cattle, and the scarcity of forbs decrease its value as sheep range.

High-ranked species:

Comments: In their vegetation key to this type, DeVelice et al. (1995) allow for the occasional dominance of *Bouteloua gracilis* and/or *Calamovilfa longifolia*, in lieu of *Hesperostipa comata (= Stipa comata)* (which is by far the usual case), to be indicative of the association. The cover of *Artemisia cana* ranges widely, spanning the values defining shrub herbaceous and shrubland categories. The type is described as shrub herbaceous because the preponderance of stands had cover of less than 25%, though the average cover just exceeded this value. This type could probably be combined with *Artemisia cana / Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL001555) without compromising the ecological information embedded in either type. This type is less moist than the *Artemisia cana / Pascopyrum smithii* Shrub Herbaceous Vegetation (CEGL001556), which contains rhizomatous wheatgrasses and/or *Nassella viridula* as dominants. In Wyoming's Cheyenne River Basin, stands of *Artemisia cana / Bouteloua gracilis - Calamovilfa longifolia* Shrub Herbaceous Vegetation (not in USNVC) (renamed *Artemisia cana* ssp. *cana / Calamovilfa longifolia* association by Thilenius et al. (1995), G.P. Jones pers. comm.) occur on well-drained sand dunes and lack, or have low coverages of, *Pascopyrum smithii*, but support *Hesperostipa comata* as 100% constant; *Hesperostipa comata* coverages approach those of the named diagnostic grasses. At least two plots of the *Artemisia cana / Hesperostipa comata* Shrub Herbaceous Vegetation (CEGL001553) having *Calamovilfa longifolia* dominant could be allocated to *Artemisia cana* ssp. *cana / Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL001555).

ELEMENT DISTRIBUTION

Range: This association is well documented from Montana and Alberta, Canada. The same or a closely analogous type occurs in Wyoming, and some permutation of the type is to be expected in northwestern North Dakota and Saskatchewan.

Nations: CA US

States/Provinces: AB:S?, MT:S3, ND?, SK?, WY?

USFS Ecoregions: 331D:CC, 331E:CC, 331F:CP, 331G:CP, M332E:CC

ELEMENT SOURCES

Authors: S.V. Cooper and C. Jean, WCS **Confidence:** 1 **Identifier:** CEGL001553

References: DeVelice et al. 1991, DeVelice et al. 1995, Thilenius et al. 1995

V.A.7.N.n. Intermittently flooded temperate or subpolar grassland with a sparse xeromorphic (evergreen and/or deciduous) shrub layer

V.A.7.N.n.1. SARCOBATUS VERMICULATUS INTERMITTENTLY FLOODED SHRUB HERBACEOUS ALLIANCE

Black Greasewood Intermittently Flooded Shrub Herbaceous Alliance

ALLIANCE CONCEPT

Summary: This alliance is found in the northern Great Plains and Rocky Mountain foothills. The vegetation typically has moderate to dense cover. Medium-tall (0.5-1.5 m) shrubs are scattered throughout; their total canopy cover is 10-25%. The shrub layer is dominated by *Sarcobatus vermiculatus*, with *Atriplex confertifolia*, *Artemisia tridentata*, and *Chrysothamnus viscidiflorus* in smaller amounts. *Symphoricarpos occidentalis* and *Rhus aromatica* are sometimes found in more mesic microhabitats within this community. Herbaceous cover is sparse beneath the shrubs and moderate to dense in between. The dominant species are typically 0.5-1 m tall. The most abundant species is *Pascopyrum smithii*, usually accompanied by *Bouteloua gracilis, Bromus japonicus, Bromus tectorum*, and *Hesperostipa comata (= Stipa comata).* Few forbs are found in this community. *Achillea millefolium* and *Opuntia polyacantha* are the only species with high constancy. Overall species diversity in this community is low.

Stands in this alliance are found on flat to gently sloping alluvial fans, terraces, lakebeds, and floodplains. *Sarcobatus vermiculatus* has been found in association with *Pascopyrum smithii* only on the most arid parts of southwestern Saskatchewan. The soil is usually deep clay, silty clay, sandy clay, or loam, although coarse soils are possible. They are saline or alkaline, but salt crusts on the surface are absent (Thilenius et al. 1995). Parent material is usually alluvium. Flooding during the spring is possible.

Environment: Shrublands included in this alliance occur on lowland sites in the northwestern Great Plains and central Wyoming. Precipitation varies with geography but ranges from 25-35 cm. Elevations range from 655-2400 m. Stands occur on flat to gently sloping alluvial fans, terraces, lakebeds, and floodplains (Mueggler and Stewart 1978, Hansen and Hoffman 1988). Dodd and Coupland (1966) found *Sarcobatus vermiculatus* in association with *Pascopyrum smithii* only on the most arid parts of southwest Saskatchewan. Sites are poorly drained and intermittently flooded with a shallow or perched water table often within 1 m depth (Hansen et al. 1995). Substrates are generally shallow, fine-textured soils (clays to silt-loams), derived from alluvium, although coarse soils are possible (Hirsch 1985, USFS 1992, Jones and Walford 1995, Thilenius et al. 1995) Soils are alkaline or saline, although not strongly saline because salt crusts do not generally form (Thilenius et al. 1995)

Adjacent upland vegetation varies with geography. In the Great Plains, it is likely short- or midgrass prairie and in central Wyoming it is typically shrublands dominated by *Artemisia tridentata*.

Vegetation: Vegetation included in this alliance is found on intermittently flooded lowland sites such as stream terraces, swales, playas and gently sloping alluvial fans in the northern Great Plains and Rocky Mountain foothills. The vegetation typically has moderate to dense cover (Jones and Walford 1995, Thilenius et al. 1995, Walford 1996) dominated by the cool-season mid grasses. The herbaceous cover is sparse beneath the shrubs and moderate to dense between them. The dominant species are typically 0.5-1 m tall. The most abundant species is *Pascopyrum smithii*, usually accompanied by *Bouteloua gracilis, Hesperostipa comata (= Stipa comata)* and the exotics *Bromus japonicus* and *Bromus tectorum*. Medium-tall (0.5-1.5 m) shrubs are scattered throughout; their total canopy is 10-25%. The shrub layer is dominated by *Sarcobatus vermiculatus*, with *Atriplex confertifolia*, *Artemisia tridentata*, and *Chrysothamnus viscidiflorus* in smaller amounts. *Symphoricarpos occidentalis* and *Rhus aromatica* are sometimes found in more mesic microhabitats within this community (Hirsch 1985). Few forbs are found in this community. *Achillea millefolium* and *Opuntia polyacantha* are the only species with high constancy. Overall species diversity in this community is low (Hansen and Hoffman 1988).

Dynamics: *Sarcobatus vermiculatus*, like many facultative halophytes, is tolerant of alkaline and saline soil conditions that allow it to occur in sites with less interspecific competition (Ungar et al. 1969, Bransen et al. 1976). *Sarcobatus vermiculatus* is often found on sites with high water tables that are intermittently flooded. Hansen et al. (1995) reported that it can tolerate saturated soil conditions for up to 40 days. *Sarcobatus vermiculatus* is not ordinarily browsed, but Daubenmire (1970) found that under heavy stocking rates the shrubs will develop a compact canopy. Hansen et al. (1995) also reported browsing damage with heavy spring and summer grazing, but noted that *Sarcobatus vermiculatus* is moderately poisonous to livestock especially in the fall, and supplemental feed is recommended to avoid livestock loss. Hanson (1929) states that *Sarcobatus*

vermiculatus can form an important part of winter forage for sheep. Fire will topkill *Sarcobatus vermiculatus*, but the shrub will promptly resprout from the root crown (Daubenmire 1970).

ALLIANCE DISTRIBUTION

Range: Stands included in this alliance occur on bottomland sites in the northern Great Plains from central Wyoming and western Nebraska to Montana and western North Dakota. The alliance probably extends into southern Saskatchewan.
Nations: CA US
States/Provinces: MT ND NE SD SK? WY
USFS Ecoregions: 331D:CC, 331F:CC, 331G:CC, 342A:CC, 342F:CC, 342G:CC, M332B:CC, M332D:CC, M332E:CC

ALLIANCE SOURCES

Authors: K. SCHULZ, WCS **Identifier:** A.1554
References: Branson et al. 1976, Brown 1971, Daubenmire 1970, Dodd and Coupland 1966, Earth Resource Technology n.d., Faber-Langendoen et al. 1996, Fisser et al. 1965, Hamner 1964, Hansen and Hoffman 1988, Hansen et al. 1988a, Hansen et al. 1995, Hanson 1929, Hirsch 1985, Johnston 1987, Jones and Walford 1995, Montana Natural Heritage Program (MTNHP) 1988, Mueggler and Stewart 1978, Mueggler and Stewart 1980, Olson and Gerhart 1982, Thilenius et al. 1995, U.S. Forest Service (USFS) 1992, Ungar et al. 1969, Walford 1996

SARCOBATUS VERMICULATUS / PASCOPYRUM SMITHII - (ELYMUS LANCEOLATUS) SHRUB HERBACEOUS VEGETATION

Black Greasewood / Western Wheatgrass - (Streamside Wild Rye) Shrub Herbaceous Vegetation
Greasewood / Western Wheatgrass Shrub Prairie

ELEMENT CONCEPT

Summary: This greasewood shrub prairie is found in saline habitats in the northwestern Great Plains of the United States and Canada. Stands occur on flat to gently sloping alluvial fans, terraces, lakebeds, and floodplains. The soil is usually deep clay, silty clay, sandy clay, or loam, although coarse soils are possible. They are saline or alkaline, but salt crusts on the surface are typically absent. Parent material is usually alluvium. This community has moderate to dense vegetation cover. Medium-tall (0.5-1.5 m) shrubs are scattered throughout with a total shrub canopy of 10-25%. The shrub layer is dominated by *Sarcobatus vermiculatus*, with *Artemisia tridentata, Atriplex confertifolia*, and *Chrysothamnus viscidiflorus* in smaller amounts. *Symphoricarpos occidentalis* and *Rhus aromatica* are sometimes found in more mesic microhabitats within this community. Herbaceous cover is sparse beneath the shrubs and otherwise moderate to dense. The dominant species are typically 0.5-1 m tall. The most abundant species is *Pascopyrum smithii*, usually accompanied by *Bouteloua gracilis, Bromus japonicus, Bromus tectorum*, and *Hesperostipa comata (= Stipa comata)*. Few forbs are found in this community. *Achillea millefolium* and *Opuntia polyacantha* are the only species with high constancy. Overall species diversity in this community is low.

Environment: This community is found on flat to gently sloping alluvial fans, terraces, lakebeds, and floodplains (Mueggler and Stewart 1978, Hansen and Hoffman 1988). Dodd and Coupland (1966) found *Sarcobatus vermiculatus* in association with *Pascopyrum smithii* only on the most arid parts of southwestern Saskatchewan. The soil is usually deep clay, silty clay, sandy clay, or loam (Hirsch 1985, Jones and Walford 1995), although coarse soils are possible (USFS 1992, Thilenius et al. 1995). They are saline or alkaline, but salt crusts on the surface are absent (Thilenius et al. 1995, but see Steinauer and Rolfsmeier 2000). Parent material is usually alluvium. Flooding during the spring is possible.

Vegetation: This community has moderate to dense vegetation cover (Jones and Walford 1995, Thilenius et al. 1995). Medium-tall (0.5-1.5 m) shrubs are scattered throughout, with a total shrub canopy of 10-25% (Hansen and Hoffman 1988, USFS 1992). The shrub layer is dominated by *Sarcobatus vermiculatus*, with *Atriplex confertifolia, Atriplex canescens, Atriplex argentea, Artemisia tridentata*, and *Chrysothamnus viscidiflorus* in smaller amounts. *Symphoricarpos occidentalis* and *Rhus aromatica* are sometimes found in more mesic microhabitats within this community (Hirsch 1985). Herbaceous cover is sparse beneath the shrubs and moderate to dense in between. The dominant species are typically 0.5-1 m tall. The most abundant species is *Pascopyrum smithii*, usually accompanied by *Bouteloua gracilis, Bromus japonicus, Bromus tectorum*, and *Hesperostipa comata (= Stipa comata)*. Few forbs are found in this community. *Achillea millefolium* and *Opuntia polyacantha* are the only species with high constancy. Other species present may include *Grindelia squarrosa*. Overall species diversity in this community is low (Hansen and Hoffman 1988, Von Loh et al. 1999). In Nebraska, shrub

species cover may be very low, and saline pockets may contain *Distichlis spicata* and *Sporobolus airoides*. *Astragalus bisulcatus* may be prominent (Steinauer and Rolfsmeier 2000).

Dynamics:

Similar Associations:

- Sarcobatus vermiculatus / Elymus elymoides - Pascopyrum smithii Shrubland (CEGL001365)
- Sarcobatus vermiculatus / Distichlis spicata - (Puccinellia nuttalliana) Shrub Herbaceous Vegetation (CEGL002146)

Synonymy:

- *Agropyron - Sarcobatus* Community (Dodd and Coupland 1966) B
- *Sarcobatus* Community (Brown 1971) =. Brown (1971) appears to have grouped the *Sarcobatus vermiculatus / Pascopyrum smithii* Sparse Shrubland and a *Sarcobatus vermiculatus / Pseudoroegneria spicata* Sparse Shrubland into one *Sarcobatus* community. The relationship of the former two communities in the ICEC is unclear.
- *Sarcobatus vermiculatus / Agropyron smithii* Habitat Type (Mueggler and Stewart 1978) =. Brown (1971) appears to have grouped the *Sarcobatus vermiculatus / Pascopyrum smithii* Sparse Shrubland and a *Sarcobatus vermiculatus / Pseudoroegneria spicata* Sparse Shrubland into one *Sarcobatus* community. The relationship of the former two communities in the ICEC is unclear.
- *Sarcobatus vermiculatus - Artemisia tridentata* Habitat Type (Hirsch 1985) B. Brown (1971) appears to have grouped the *Sarcobatus vermiculatus / Pascopyrum smithii* Sparse Shrubland and a *Sarcobatus vermiculatus / Pseudoroegneria spicata* Sparse Shrubland into one *Sarcobatus* community. The relationship of the former two communities in the ICEC is unclear.
- *Sarcobatus vermiculatus - Artemisia tridentata / Elytrigia smithii* Plant Association (Johnston 1987) =. Brown (1971) appears to have grouped the *Sarcobatus vermiculatus / Pascopyrum smithii* Sparse Shrubland and a *Sarcobatus vermiculatus / Pseudoroegneria spicata* Sparse Shrubland into one *Sarcobatus* community. The relationship of the former two communities in the ICEC is unclear.
- *Sarcobatus vermiculatus / Agropyron smithii* Habitat Type (Hansen et al. 1984) =. Brown (1971) appears to have grouped the *Sarcobatus vermiculatus / Pascopyrum smithii* Sparse Shrubland and a *Sarcobatus vermiculatus / Pseudoroegneria spicata* Sparse Shrubland into one *Sarcobatus* community. The relationship of the former two communities in the ICEC is unclear.
- *Sarcobatus vermiculatus / Agropyron smithii* Habitat Type (U.S. Forest Service (USFS) 1992) =. Brown (1971) appears to have grouped the *Sarcobatus vermiculatus / Pascopyrum smithii* Sparse Shrubland and a *Sarcobatus vermiculatus / Pseudoroegneria spicata* Sparse Shrubland into one *Sarcobatus* community. The relationship of the former two communities in the ICEC is unclear.
- Black Greasewood/Western Wheatgrass Community (Jones and Walford 1995) =. Brown (1971) appears to have grouped the *Sarcobatus vermiculatus / Pascopyrum smithii* Sparse Shrubland and a *Sarcobatus vermiculatus / Pseudoroegneria spicata* Sparse Shrubland into one *Sarcobatus* community. The relationship of the former two communities in the ICEC is unclear.
- *Sarcobatus vermiculatus / Agropyron smithii - Bouteloua gracilis* Shrub Steppe (Thilenius et al. 1995) =. Brown (1971) appears to have grouped the *Sarcobatus vermiculatus / Pascopyrum smithii* Sparse Shrubland and a *Sarcobatus vermiculatus / Pseudoroegneria spicata* Sparse Shrubland into one *Sarcobatus* community. The relationship of the former two communities in the ICEC is unclear.
- Greasewood Shrub Prairie (Steinauer and Rolfsmeier 2000) =. Brown (1971) appears to have grouped the *Sarcobatus vermiculatus / Pascopyrum smithii* Sparse Shrubland and a *Sarcobatus vermiculatus / Pseudoroegneria spicata* Sparse Shrubland into one *Sarcobatus* community. The relationship of the former two communities in the ICEC is unclear.

GRank & Reasons: G4 (96-02-01).

High-ranked species:

Comments: Compare this association with *Sarcobatus vermiculatus / Elymus elymoides - Pascopyrum smithii* Shrubland (CEGL001365) from New Mexico.

See Steinauer and Rolfsmeier (2000) for a description of the stands in Nebraska. *Sarcobatus vermiculatus / Distichlis spicata - (Puccinellia nuttalliana)* Shrub Herbaceous Vegetation (CEGL002146) may be a more saline version of this type.

ELEMENT DISTRIBUTION

Range: This greasewood shrub prairie is found in saline habitats in the northwestern Great Plains of the United States and Canada, ranging from northwestern Nebraska north to the Dakotas and Saskatchewan.

Nations: CA? US

States/Provinces: MT:S4, ND:S4?, NE:S2, SD:SU, SK?, WY:S4

USFS Ecoregions: 331D:CC, 331F:CC, 331G:CC, 342A:CC, 342F:CC, 342G:CC, M332B:CC, M332D:CC, M332E:CC

ELEMENT SOURCES

Authors: J. Drake, WCS **Confidence:** 1 **Identifier:** CEGL001508

References: Brown 1971, Dodd and Coupland 1966, Earth Resource Technology n.d., Fisser et al. 1965, Hamner 1964, Hansen and Hoffman 1988, Hansen et al. 1984, Hirsch 1985, Johnston 1987, Jones and Walford 1995, Montana Natural Heritage Program (MTNHP) 1988, Mueggler and Stewart 1978, Mueggler and Stewart 1980, Olson and Gerhart 1982, Steinauer and Rolfsmeier 2000, Thilenius et al. 1995, U.S. Forest Service (USFS) 1992, Von Loh et al. 1999

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